NUTRITION

In Health and Disease

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Preface to Twelfth Edition

The concept of nutrition since it was first recognized as a science has broadened in ratio to the increasing scope of research in many universities and other institutions. The practical application of research has brought recognition of the important part that this science plays in the attainment and the maintenance of general health, as well as in the treatment of many diseases that formerly received only medical treatment. Nutrition interpreted in terms of adequate food supplies is now recognized as a large factor in the economic welfare of all nations. Diplomats, economists, physicians, teachers, dietitians and nurses now join in the interpretation of this science in the interests of all people. The twelfth edition of *Nutrition in Health and Disease* has been prepared with all these factors in mind, and especially with a view to the part that the nurse may play in promoting better nutrition. Another aim of the authors has been to make this text meet the needs of college students of home economics who may wish to expand the subject by the use of the extensive references given in Part Four. The intelligent nonprofessional reader also will find this book a valuable reference.

Part One, "Principles of Nutrition," places special emphasis on the normal metabolism of the various food constituents. Attention is called also to the world significance and the relative importance of specific foods in widely different dietary patterns. The chapter on Energy Metabolism has been revised to explain the present accepted method for calculating food values more accurately than formerly. All tables and charts in the book have been revised to conform to the new Food Tables in Part Four.

Part Two, "Diet in Disease." All the chapters have been revised according to the latest developments in the treatment of disease. Particular attention is called to the complete revision of the chapter on Obesity. To the chapter on Fevers and Infections has been added a diet for the treatment of poliomyelitis. The chapter on Diseases of the Intestines has been rewritten according to the latest developments in the field. In the chapter on Vascular and Cardiac Diseases, the suggestions for Low Cholesterol and Low Fat Diets will be found to be useful. The chapter which covers Diseases of Infants and Children has been completely revised. Throughout this section tables have been tabulated for greater convenience in use.

Part Three, "Food Selection and Preparation," which co-ordinates the discussion of food materials and their preparation, has been revised. A

new chapter, No. 50, in which therapeutic recipes are grouped, has been added and special attention has been given to the low sodium recipe portion. Small-quantity recipes are of use to the nurse or the homemaker who cooks for a patient or for one or two people in the home.

Part Four, "Tabular Material and Special Tests." Table 1 has been completely reset with figures taken from Handbook No. 8, Composition of Foods, U.S. Department of Agriculture. The table, Cholesterol Content of Foods, has been added, and the table, Sodium Content of Foods, has been extended to include condiments and seasonings. A glossary of scientific terms is provided for the convenience of the student. Up-to-date references are classified by subject in the same order as the chapters in the book.

Throughout the twelfth edition attention has been paid to making the text more readable by introducing information of current interest. The review questions at the end of each chapter have been worded in line with the best teaching practices. It is recommended that the *Teacher's Manual on Nutrition for Nurses*, by Henderika J. Rynbergen, be used in connection with this text. The authors hope that not only will this book serve the nurse during training but that it will also be used as a reference book by the graduate nurse, the dietitian, the college instructor and the homemaker.

Preface to First Edition

Long association with medical institutions both as dietitians and as teachers of dietitians and nurses has led the authors to believe that the present status of the subject of dietetics demands a somewhat different emphasis from that formerly placed upon it. Our experience shows also that there is a real need for a single volume which may serve as a handbook on the subjects of nutrition and diet in disease, two subjects so intimately and vitally connected as to necessitate their being inseparably united in the mind of the nurse. At the request of former students and others who later became teachers of nurses in the field of dietetics, this volume has been prepared.

This book presents the newer ideas in both the principles of nutrition and the practice of dietetics, based upon the most recent experimentation and study as well as upon the established knowledge of earlier research findings.

It includes the prevailing practices of leading physicians in the field of nutrition as applied to health and disease. When physicians differ greatly in their dietary practices, the authors have endeavored to present the consensus of opinion, where such exists, or the prevailing regimens, with the scientific principles involved. Throughout the book the preventive and remedial aspects of nutrition have been emphasized. Not only the needs of the bedside nurse have been kept in mind, but also the problems of the public health nurse who must cope with poverty, racial preferences, and established food habits as complicating factors.

The content of the book is arranged to cover two courses. Parts One, Two, and Four comprise the subject matter for the first course: Principles of Nutrition and Cookery. Part One consists of fifteen one-hour class periods, devoted to the principles of nutrition. Part Two consists of fifteen short lessons on foods and is intended to cover the first half hour of a two-hour laboratory period, the remaining one and one-half hours being devoted to food preparation, the recipes for which are supplied in Part Four. It will be noted that these recipes are generally for small quantities, designed for the use of the nurse who must cook for one patient.

Part Three consists of fifteen one-hour lectures constituting the second course: Diet in Disease.

While the book is written with the needs of the nurse in mind, the authors believe it is adapted to the needs of the liberal arts student whose crowded program does not permit of more than two or three semester hours for a course in Foods and Nutrition. It is hoped that even the busy housewife whose responsibilities to her family involve the planning of menus, the

buying of food, as well as the preparation of it, will also find much of value in it.

It is also the hope of the authors that the book may contribute to the sum total of knowledge and to the interest in the science of nutrition as the cornerstone in the health of the individual, and ultimately, the nation at large.

THE AUTHORS

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To their many friends and associates the authors wish to express their deep appreciation of advice and time spent by them in reviewing and revising the manuscript. Special thanks are due Miss Marjorie Heseltine, Nutrition Specialist in the United States Children's Bureau, for assistance with Chapters 12, 13 and 14; to Dr. Jean Broadhurst, Professor-Emeritus of Bacteriology at Columbia University, for her contributions to Chapter 16; to Mrs. Gladys Cook, Assistant Professor in the School of Home Economics, University of Massachusetts, for editorial assistance in Parts One and Four; and to several physicians at New York Hospital and Montefiore Hospital, New York City, for advice and comment.

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Part One

PRINCIPLES OF NUTRITION

Part One deals with the
Principles of Normal Nutrition
and their application
to all age and sex categories

CHAPTER ONE

Nutrition and Optimum Health

THE MEANING OF NUTRITION
HEALTH AND EFFICIENCY
NUTRITION THROUGH THE AGES
NUTRITION, A NATIONAL AND INTERNATIONAL ISSUE TODAY
PREVALENCE OF NUTRITIONAL DEFICIENCIES
NUTRITIONAL IMPROVEMENT YIELDS RESULTS
AMERICAN FOOD HABITS HAVE IMPROVED
POPULAR GUIDES FOR BETTER NUTRITION
COMMUNITY NUTRITION PROGRAMS

THE MEANING OF NUTRITION

The term "nutrition" is usually used in one of the following two meanings: (1) The sum of the processes concerned with growth, maintenance and repair of the living body as a whole or of its constituent parts; (2) the process of supplying of the body with necessary food nutrients. Rose[1] suggested that a distinction be made between nutrition, which deals with the scientific laws governing the food requirements of human beings for maintenance, growth, activity, reproduction and lactation, and dietetics, which deals with the practical application of these laws to individuals and groups in health and in sickness. In line with this concept, a nutritionist is one who investigates and gives information on nutrition to others so that they may use it, while a dietitian is one who plans diets and supervises or administers food service and often teaches as well.

Stare and Davidson[2] have defined more explicitly the meaning of good nutrition as follows:

"Good nutrition for an individual implies that he receive and utilize a suitable metabolic mixture of all substances necessary for health. This can be obtained only from food selected, processed, prepared, consumed, absorbed and utilized so that it furnishes in optimal amounts the individual's essential nutrients. Such a diet must contain protein, fat, carbohydrate, certain minerals and vitamins, and water in optimum amounts. The optimum allowance which is recommended for each nutrient should be much greater than the minimum requirement of that nutrient. That is, provision must be made not only for actual requirements but also for variations from the 'normal' both in health and in disease, for the accumulation of some

[1] Rose, M. S.: Nutrition Abstr. & Rev. 4:439, 1935.

[2] Stare, F. J., and Davidson, C. S.: J.A.M.A. 127:985, 1945.

'reserves' and for differences in actual food intake due to food habits, individual tastes and variations in economic status."

This concept is not the opinion of a few persons but the culmination of years of study and research. The application of this knowledge of nutrition has been gradually improving the American norm of health and physique since very soon after the turn of the century. The responsibility of every student of health today is to take an active part in applying the results of scientific research in order that there may be a fuller and a more far-reaching nutritional improvement of human life in the future. Thus, nutrition today has assumed full stature as one of the health and medical sciences.

HEALTH AND EFFICIENCY

Good health and efficiency depend upon food adjusted to meet the needs of the body throughout the whole life span. This need for adjustment begins with the pregnant woman, the nursing mother and infant and continues through adolescence and maturity. The well-nourished individual is alert mentally and physically, has a wholesome and optimistic outlook on life, has good resistance to infections and shows numerous other signs of good health.

Not only can good nutrition contribute to everyday health, but the life span may be increased by extending the active and vigorous period of life. By using animals with a shorter life span than man, Sherman has shown, by carefully controlled experiments on 27 generations of rats, that good diet can extend the life span by 10 per cent.

The real job of planning for health and efficiency of future generations depends upon the formation of good health habits in today's children. Inheritance may account for tall parents' having tall children, but there is also the probability that the foods which make for growth were served habitually in those households.

NUTRITION THROUGH THE AGES

Food always has been recognized as one of the most vital necessities of life. Man's interest in its nutritive qualities began before the dawn of civilization, and it has continued to grow throughout the ages. This interest did not develop into a distinct science of nutrition, however, until the twentieth century.

Egypt. On an old millstone found in Egypt some years ago there is engraved what is perhaps the oldest writing in existence. It is a copy of an old papyrus that dates back to about 3400 B.C. It was written as a hymn of praise to the God Ptah, extolling him as the supreme Sun God. The manuscript reveals the existence of a government that apparently was vitally interested in food, for it reads:

"And thus the stations [official positions] were made and the functions [of government] were assigned, which furnished all nutrition and all food. . . . Everything has come forth from him, whether food, or nutrition, or food of the gods, or any good thing."[3]

Babylonia. The interest of the ancients in food and in dietary matters is shown, it will be remembered,

[3] Breasted, J. H.: The Dawn of Conscience, New York, Scribner, 1933.

by the biblical story of Daniel and his three companions who were chosen to stand before King Nebuchadnezzar of Babylon as "youths in whom there was no blemish . . . and understanding science." They were to receive daily a portion of the king's dainties and his wine. But Daniel objected to this regimen, much to the consternation of the chief eunuch, who feared the king's displeasure if these young men's countenances should be "worse-looking than those of other youths." Daniel then instituted what was probably the first dietary experiment when he persuaded the chief eunuch to allow him and his companions to be given, for a period of ten days, a diet of pulse (legumes, such as peas, beans and lentils) in place of the king's meat, and water in place of his wine. It will be remembered that at the end of the ten days, they looked so well that they were allowed to continue in their own way, and at the end of their three years' training, the king found them "ten times better than all the magicians and enchanters that were in all his realm." Thus we see a beginning, at about 600 B.C., of an appreciation of things "scientific," even though a very meager fund of knowledge existed. Confidence in magic was beginning to wane.

Greece. Primitive man soon learned to associate his diseases with his food supply. Even the medicine man of the time was primarily interested in the food of the patient. Having nothing but his own experience as a guide, it is not surprising that many erroneous ideas prevailed. There was no one to challenge seriously these ancient superstitions until Hippocrates arrived on the scene of action about 460 B.C. He linked the development of medicine to that of nutrition and recognized that all foods might not suit all people.

Dawn of the Experimental Method. While Hippocrates challenged the old order of things, it was not until after the beginning of the Christian era that the experimental method really was initiated. Galen (A.D. 130 to 200), after finishing the medical course of his time, went from Greece to Alexandria in Egypt, where he was allowed to dissect the bodies of executed criminals. Later he experimented upon hogs and, as a result of his experiments, concluded that the stomach was a place in which food could be resolved into particles sufficiently small to be absorbed.

Experimental research as a necessary factor in the study of medicine was given a great impetus by Galen. However, for more than a thousand years after his death little progress was made. During the sixteenth century Leonardo da Vinci of Italy contributed to the fundamentals of medicine his unsurpassed anatomic drawings. About the seventeenth century progress in medicine began in reality: Harvey demonstrated the circulation of the blood. In the eighteenth century Lavoisier, the French scientist, became interested in the study of metabolism, or what becomes of the food after it is digested in the body. Lavoisier was followed in the nineteenth century by such illustrious men as Liebig, Voit and Rubner.

While new concepts of nutrition were developing in Germany and several other European countries, in France Pasteur was astonishing scientific circles with his discoveries in

the field of bacteriology, hygiene and the value of antiseptics, introducing a new era in public health. Even earlier, Florence Nightingale had recognized that good nursing demanded hygienic conditions and adequate food and thus revolutionized the care of wounded soldiers in the Crimea (see p. 231).

The twentieth century brought wide interest in all phases of health and prevention of disease. In the United States the names of Lusk, Chittenden, Mendel, McCollum, Murlin, Benedict, Sherman and Mary Swartz Rose stand out as pioneers in their respective fields of nutrition research.

Evolution in Nutrition Research. Early in the twentieth century research workers in food chemistry and in physiology in Europe and in America demonstrated the need of good-quality protein for the growth of animals. Later the concept of the number and the type of minerals needed for growth came to include trace elements, as well as those present in larger amounts. At the same time other workers had shown the presence and the need for certain "accessory food factors," later called vitamins. Then followed in rapid succession studies in essential fatty acids, hormones, enzymes, chemical regulators and intermediary products of digestion and metabolism.

Research methods and scientific tools have kept pace with changing concepts. First, the chemist analyzed foods for protein, fat, total ash and moisture, and assumed the balance to be carbohydrate in nature. Then he analyzed the ash for its specific mineral constituents. Later, animal-feeding experiments supplemented the chemist's data by showing that the hitherto unrecognized food factors were necessary for growth and that the rate of growth could be used to measure the presence of such substances. This method is known as bio-assay. Now micro-organisms are being used, and the method is called microbiologic assay.

New methods were developed for studying the processes of metabolism and its end products. At first animals were used for such studies. As differences in species became evident it was obvious that research on human subjects would be the only way to understand human metabolism. Thus the present trend is the study of nutritional status of human subjects under carefully controlled conditions.

Groups of laboratories in various parts of the United States are working together on co-operative projects too extensive for any one laboratory to undertake. The Bureau of Human Nutrition and Home Economics and the Office of Experiment Stations are giving Federal support to nutrition studies which should yield basic information of benefit to us all.

NUTRITION, A NATIONAL AND INTERNATIONAL ISSUE TODAY

The science of nutrition took on new significance during and after World War II. To be sure, the League of Nations had attempted to set up standards for adequate nutrition as far back as 1935, and these recommendations had been recognized by many countries; but there was limited basis for many of the standards proposed at that time. The war gave impetus to research in the United States and to

application of the available knowledge in order to keep people as well as possible during the extreme strain of the war years. The National Nutrition Conference in 1941 launched a nation-wide program, with nutrition committees set up in nearly every state doing an active job of promoting better nutrition. At about the same time the National Research Council established the Food and Nutrition Board to study the broad problems of nutrition on a national and international scale. One of their first accomplishments was to establish Recommended Dietary Allowances for various age and sex categories. These allowances will be discussed in Chapter 9.

It will suffice to say here that this "yardstick" of good nutrition published first in 1941, revised in 1945 and again in 1948, has done much to give nutrition education in this country a common goal. The concept of what better nutrition can mean to a nation was not new, but there is a new emphasis with the realization that international planning needs to be done to ensure even a degree of good nutrition for all people.

The importance of food in making peace terms work is emphasized by the fact that one of the first international organizations was set up to help consumers and food producers plan for a better-fed world. The United Nations Food and Agriculture Organization (FAO) grew out of the meeting held at Hot Springs, Va., in May, 1943, and was launched as a full-fledged international organization in Quebec, Canada, in October, 1945, under the leadership of Lord John Boyd Orr, a world leader in the field of nutrition. He was the 1949 recipient of the Nobel Peace Prize in recognition of his leadership in this work. The FAO is concerned not so much with the theories and the terms of peace as with the establishment of conditions that will help to make peace.

Two thirds of the world's people never have had enough to eat or the right kind of food to promote health. In the past it was accepted as a foregone conclusion that hunger was the inevitable lot of a large proportion of mankind, even though two thirds of the people in the world were engaged in agriculture. Even many of those who produce the food do not get enough of it or the right kind. Today, science is trying to provide information on how to produce enough food to feed the world, and the FAO is a first step toward putting that information to work by joint planning.

The FAO was the first of three United Nations organizations to face the problem of nutrition. It is noticeable that nutrition is mentioned and emphasized repeatedly in the FAO articles of organization. The science of nutrition ties in on the one hand with the agriculture of nations and on the other with the health of nations. The World Health Organization (WHO) is another United Nations subdivision concerned specifically with the health of the world's people. Still another UN subdivision—the United Nations Educational, Scientific and Cultural Organization (UNESCO)—is concerned with improving the standard of living of the world's people. To that end UNESCO is attempting to provide means whereby more people may have at least an elementary edu-

cation, including some simple rules of health. UNESCO has selected *Food and People* as a major topic for study and for a series of publications under that title. These well-written and illustrated pamphlets provide vivid glimpses into the world's food problems and its resources for feeding an increasing population. Of first concern is the quantity of food to provide sufficient calories. A world map (Fig. 1) from *UN Sets the Table*[4] shows several densely populated countries where calories provided were less than 2,250 per person in 1939, whereas the United States and others of the more prosperous countries had more than 2,750 calories per capita. In many areas the situation is worse today than in 1939.

A joint Nutrition Advisory Committee of experts from several countries is working to co-ordinate the activities of FAO, WHO and UNESCO where they have common concern for the food and the nutrition of people everywhere.

The purpose of these groups and of FAO in particular is essentially a movement to wipe out mass hunger and lift the burdens of hopeless poverty from men's shoulders by applying modern scientific knowledge to the development of the earth's resources. It is a far more fundamental solution to the world's ills than the military and the political preoccupation that seems to absorb the attention of most governments.[5]

[4] Kihss, Peter: UN Sets the Table, Food and People series, UNESCO, 1950.

[5] Director-General's Report: World War Against Want, the Work of FAO, 1950-51.

PREVALENCE OF NUTRITIONAL DEFICIENCIES

United Nations agencies and others study continuously the areas of the world where nutritional deficiencies still exist. Some of the deficiency diseases discussed in Chapter 20 are seldom found in the United States today, but all of them and more are found in the world today. Every student of nutrition who is also a good citizen should be conscious of world health problems. Beriberi, scurvy, pellagra and rickets still appear in many countries, but less so than previously since the science of nutrition has discovered how something can be done to relieve them. Less-well-known conditions, such as kwashiorkor among children in many parts of Africa, have been recognized more recently as deficiency diseases.

In order to study the extent of a nutrition problem in a given area or country, a team of workers consisting of medical men and nutritionists may make a survey. Large samples of population groups are given physical examinations to discover their nutritional status. Nutritionists may study the food pattern of the people and the nutrients available and attempt to correlate their findings with the medical picture. Recommendations for improvement of the situation must take into account local resources, nutritive value of native foods and ways in which they are used. Finally, consideration is given to what help may be needed from outside.

The United States still has mild nutritional deficiencies, especially among people of low income and limited education. Often these de-

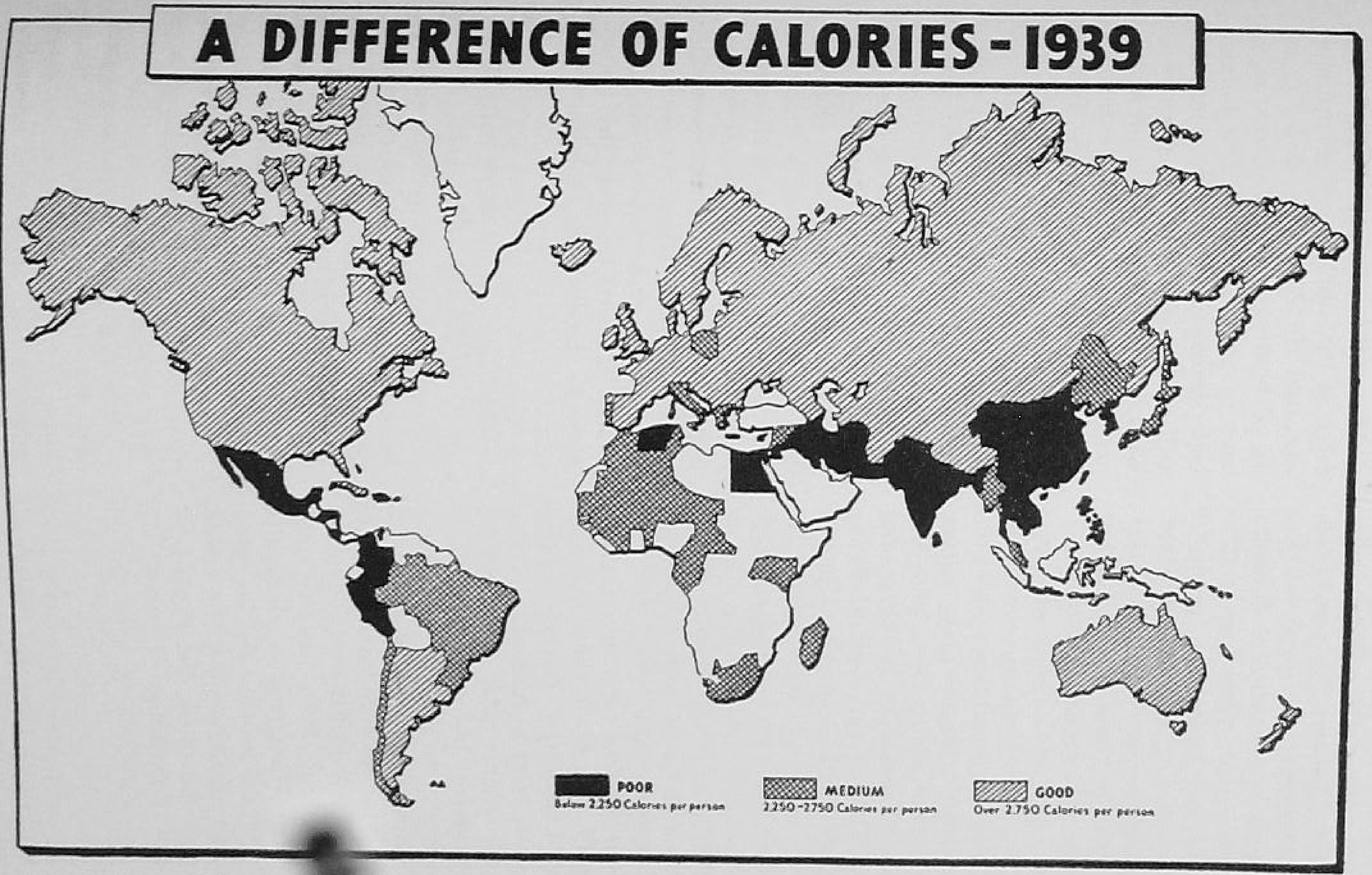


FIG. 1. From *U.N. Sets the Table*, by Peter Kihss, Food and People Series, No. 2, a UNESCO project, New York, Manhattan Publishing Co., 1950.

ficiencies are termed subclinical because they are not the frank deficiency diseases found in India, China or Africa. Vague or chronic ill-health—in fact, anything less than a state of well-being—cannot be accepted complacently in the United States today because we have the knowledge and the resources to discover the cause and suggest a remedy.

As one part of the National Nutrition Program initiated during World War II, the National Research Council published a report of its survey entitled *Inadequate Diets and Nutritional Deficiencies in the United States*.[6] Dietary surveys had shown that large numbers of people in this country were not eating foods to provide nutrients recommended. Fewer studies had been made on the nutritional status of large groups of people because such studies are more expensive and time-consuming. Nutritional status must be measured by health and by medical examination of individuals. Dietary surveys may show diets to be faulty or even seriously inadequate according to our standards, but evidence of serious malnutrition may not be conspicuous. However, poor diets predispose a proportion of such groups to the possibility of physical ills or defects resulting from habitual malnutrition. Therefore, a distinction should be made between the extent to which diets seem to be inadequate, as shown by dietary surveys, and the prevalence of actual deficiency conditions in a population group.

[6] National Research Council Bulletin 109, Inadequate Diets and Nutritional Deficiencies in the United States, Washington, Nov., 1943.

The application of existing knowledge of the significance of optimum nutrition for health is slow, as are all preventive or prophylactic measures in public health. The benefits lack drama and can be measured with difficulty only after years of work. There have been premature and exaggerated claims for the immediate benefits to be derived from optimum versus merely adequate nutrition. The report just mentioned concludes "that buoyant health, not merely passable health, is the objective of modern health philosophy and practice," and that "the evidence now available, incomplete as it may seem, leads to but one conclusion: it is that there is a real difference, as measured in terms of growth, development and general-health record, between optimum and just adequate nutrition; and that every practical effort should be made to apply this knowledge in the interest of human welfare."

NUTRITIONAL IMPROVEMENT YIELDS RESULTS

Food and nutrition experts have been teaching for decades the value of good food, but it is difficult to evaluate the results of their efforts. The evidence is all around us in the robust health of most children today. But statistical or scientific evidence of accomplishment is necessary if governments are to initiate and support such programs.

The relation between the customary diet and the nutritional status must be studied in order to determine the type of program necessary. Surveys need to be made before programs are initiated and at intervals

after they have started in order to determine their effectiveness. The incidence of signs and symptoms of nutritional failure, work efficiency and growth patterns of infants and children are valuable criteria for judging the effectiveness of a program. Such studies have been made on isolated population groups, and these afford good evidence that improvement of the diet can benefit nutritional status.

In Great Britain[7] during World War II it was demonstrated that "improvement of the diet of workmen whose diet was not previously up to the standard for health was followed by increased output without any conscious increased effort and also by a reduction in the number of accidents." In the United States the importance attached to proper feeding of industrial workers has come to be appreciated to the extent that provision of adequate food for employees has continued to be emphasized where there is progressive plant management. The men in the armed forces in general received rations that equaled or exceeded recommended allowances. The health and the general stamina of the men were better than in any previous war. There was room for improvement in health in even the physically fit men of this country and good food had a big part in promoting this improvement.

Among the post-war studies, those in Newfoundland and in the Philippines are notable examples of measured accomplishment. In Newfoundland, the fisherfolk live in isolated coastal villages shut off from outside supplies except for about 2 months in the summer. One of the authors made a survey in several of the northern outposts 15 years prior to the more recent study begun in 1944 in some of the southern outposts. The conditions were strikingly similar. The signs and the symptoms found on clinical examination and biologic tests in 1944 were indicative of a multiple vitamin deficiency. The enrichment of margarine with vitamins A and D and of all-white flour with three B vitamins plus iron and calcium became effective in June, 1944. When the second survey was made in 1948, there was a striking improvement in health, particularly in those symptoms which might have been expected to respond to the nutritional factors provided in the enrichment program. Beriberi, which had been widespread in years prior to 1943, was practically nonexistent in 1948, and tuberculosis deaths have been cut in half in 8 years.[8] The policy of flour enrichment in Newfoundland has been maintained since her union with Canada in 1949, and there is enthusiastic support for it as a consequence of the health improvement accomplished.

The enrichment of flour and bread in the United States has been in effect for over 10 years in many states and is now mandatory in 26 states, Hawaii and Puerto Rico. Accomplishment of this program in the United States cannot be measured as it was measured in New-

[7] Orr, John Boyd: Brit. M. J., Jan. 18, 1941, p. 73.

[8] Medical Survey and Resurvey in Newfoundland, 1944 and 1948: Canad. M. A. J. **52**:227, 1945; **60**:329, 1949.

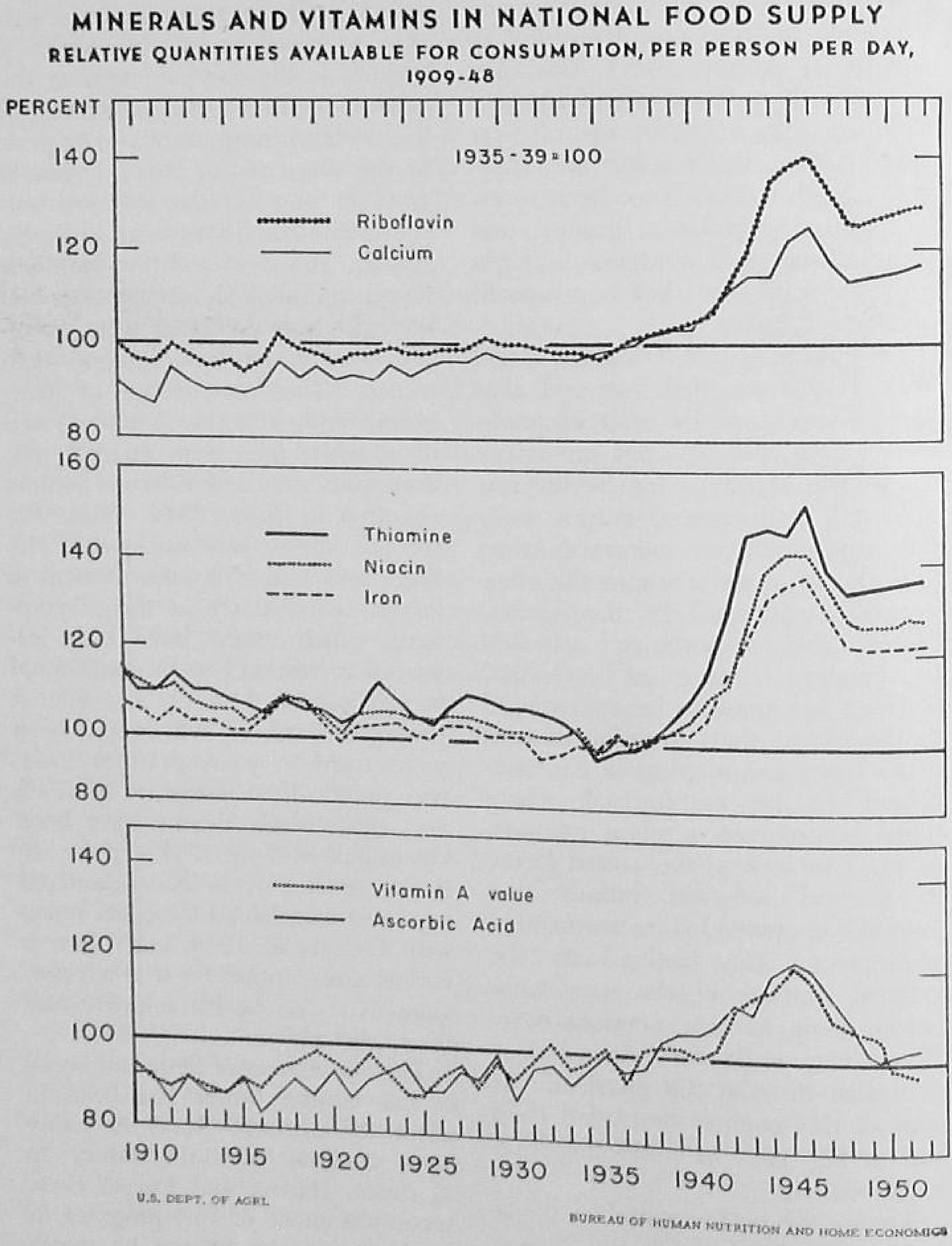


FIGURE 2

(Phipard and Stiebling, Adequacy of American Diets. Calcium, Iron and Vitamins in the United States Per Capita Food Supply, 1909-1948. J.A.M.A. 139:579 and personal communications on data up to 1952.)

foundland, but the findings there should help persuade the skeptics that there is merit in the program. The principle of enrichment has been applied to corn products in some Southern states.

Rice is the predominent grain of the Orient and the chief cereal food of more than half the world's population. Beriberi has long been associated with the eating of polished rice, the form preferred by most of these peoples. Few of these countries have adequate statistics to give a true picture of the incidence of beriberi, but the Philippines have kept records since 1920. On the peninsula of Bataan, deaths from beriberi had ranged from 150 to 300 a year, and as many as 12,000 persons gave evidence of health continually impaired by beriberi symptoms. Since the initiation of the rice-enrichment program in 1949, inspired and directed by Dr. R. R. Williams, the incidence of beriberi has been reduced about 90 per cent, and not a single death from beriberi occurred for 2 years.[9] While education may have been able to stimulate some improvement in food habits and in methods of milling of rice over a long period of time, it is unlikely that any such accomplishment as that reported above ever could have been realized even within the lifetime of the children.

Other studies on smaller groups of children or adults in this country in institutions where diet could be controlled and nutritional status studied have also shown that food providing essential nutrients can not only cure deficiencies but make the difference between mediocre and bouyant health.

AMERICAN FOOD HABITS HAVE IMPROVED

Comment on the history of nutrition in this country would not be complete without mention of the changes in the food consumption pattern. The Department of Agriculture has compiled figures on the types and the amounts of foods used in this country over a period of 43 years (1909-1952). During this time there has been a marked decrease in the use of grain products and potatoes and an increase in the use of dairy products, vegetables, especially the green and yellow types, and in citrus fruits. What these changes have meant in terms of nutritional factors is shown in the accompanying charts.

It is interesting to speculate upon what factors—economic, educational or other—may have influenced these changes. During the period following 1941, when the national nutrition program was launched and when bread-and-flour enrichment was started, is the time where most of the nutrient curves show marked improvement. In a sense these changes are a measure of accomplishment of nutritionists, public health nurses and educators. After studying the chapters concerning the food nutrients mentioned, it will be interesting to turn back to this chart and study it again.

While these results are encouraging, they do not leave us with a feeling of complacency, especially when we note the drop in all nutrients in the diet since 1945. The

[9] Williams, R. R.: Am. J. Nursing **52**: 447, 1952.

amounts are still liberal, but if the downward trend were to continue it might be serious. The fact that these amounts of foods and nutrients are available does not mean that they all go into mouths of the people that need them. Much food is wasted and it is not evenly distributed. The income of many people has not risen with the cost of living. Some cannot afford to buy as many of the protective foods as formerly. Others are still indifferent to what good nutrition can mean. Therefore, it is apparent that there can be no relaxing of effort to create both the means and the desire for everyone to buy adequate foods.

POPULAR GUIDES FOR BETTER NUTRITION

For many years nutritionists have offered homemakers easy guides for meal planning. Such guides or dietary patterns differ slightly in their wording but give essentially the same advice. Several commercial agencies offer these guides in colorful pictorial form. One of the best known of these is "The Guide to Good Eating," prepared by the National Dairy Council.

The basic dietary pattern adopted for this text is essentially the same as that recommended by the American Dietetic Association.[10] It will be used repeatedly in discussion of nutrients and in planning therapeutic diets.

Dietary Pattern for One Day

Milk (or its equivalent in milk products):
- 1 pint for an adult
- 1½ pints to 1 quart for infant or child

Vegetables, 2 servings:
- 1 dark green or yellow
- 1 potato
- 1 other (one of these should be raw)

Fruits, 2 servings:
- 1 citrus or tomato
- 1 other

Eggs: 1, or at least 3 or 4 a week (1 daily for young children)

Lean meats, fish, poultry (or other meat alternates): 1 serving

Cereals or bread (whole grain or enriched): at least 2 servings

Butter or fortified margarine: at least 4 teaspoons

Other foods as necessary to meet caloric requirement and to add palatability. There may be more of the same foods listed above or others

Notes: 1 serving vegetables or fruits equals ½ to ⅔ cup
- 1 serving meat, etc., equals 2 to 3 ounces (edible portion) meat, fish or poultry or the equivalent in an alternate
- 1 serving cereal or bread equals 1 ounce dry weight or a 1 ounce slice

Such a pattern allows for considerable variation to meet the differences in taste preferences, nationality food patterns and cost.

This concept of dietary needs is the same as the "Basic Seven" food chart (Fig. 3). This chart was issued in poster and in pamphlet form and was used extensively by the food industries in advertising. Even though this was first published during World War II as part of the national nutrition program, the information is as sound today and is still a good device for teaching and checking food habits.

Nutrition films produced by educational or commercial agencies are frequently useful for popular edu-

[10] A Manual for Teaching Dietetics to Nurses, American Dietetic Association, Philadelphia, Saunders, 1949.

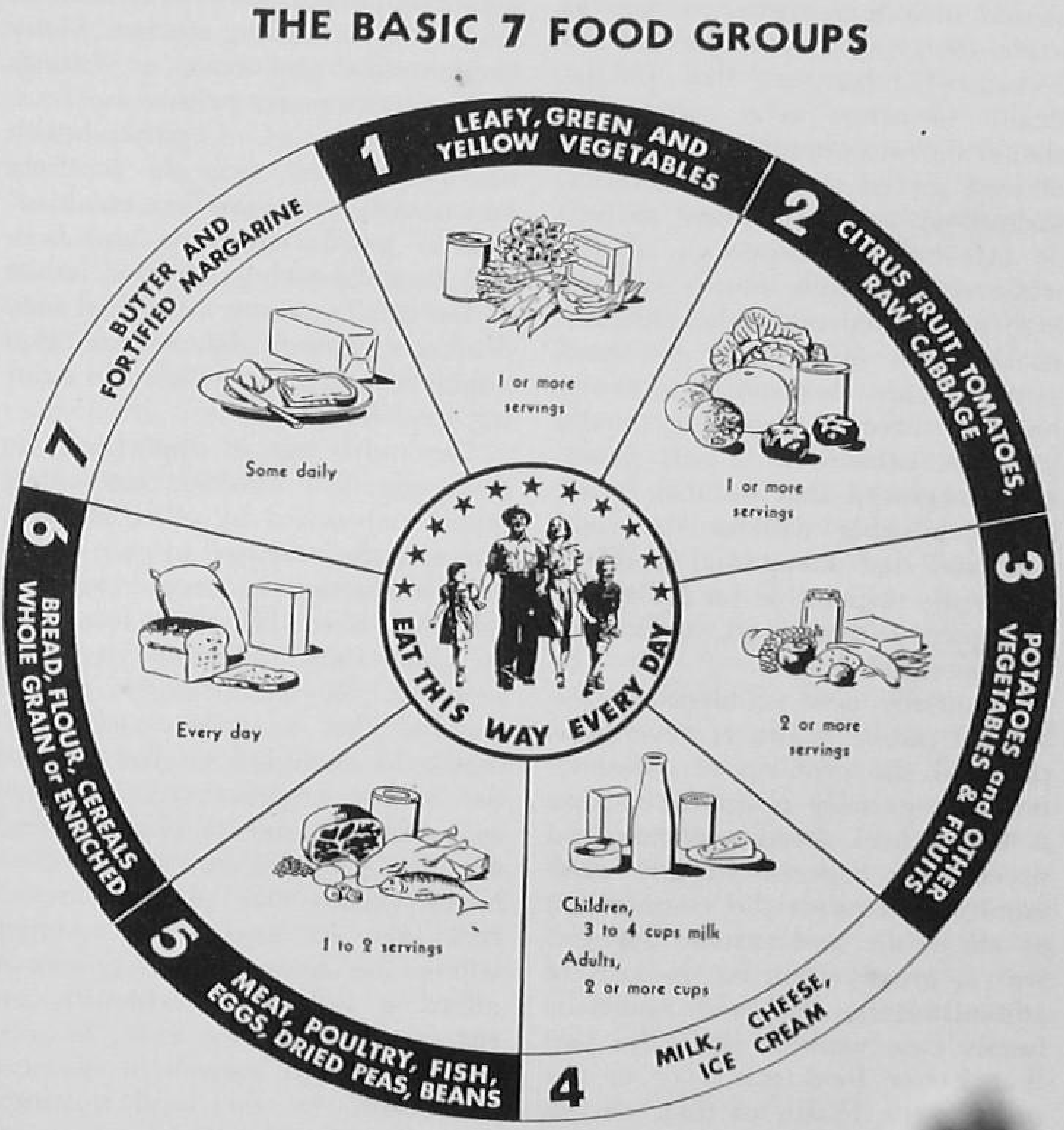


Fig. 3. Poster issued by Bureau of Human Nutrition and Home Economics, U. S. Department of Agriculture, Washington.

cation in nutrition. Popular talks on nutrition are often more impressive if accompanied by one or two short films, facilities permitting.

Canada's Food Rules are very similar to ours, and they have also produced some good educational films.

COMMUNITY NUTRITION PROGRAMS

Community health programs always have had as a chief objective prevention or prophylaxis against disease, but only recently have public-health officials come to the realization that health education

should include nutrition as well as a knowledge of how to prevent the spread of infections; that public-health measures in a community should include attention to the kind of food served in schools, factories, institutions and restaurants, as well as attention to inspection of the water and the milk supply and the hygiene of food establishments. Education and opportunity for good nutrition are becoming a major part of every community health program, because it is now generally recognized that optimal health is not possible without the right food and that suboptimal health is frequently responsible for indigence, delinquency, discomfort, inefficiency and potential disease.

To attack new problems in the field of public health is never simple, and the problem of malnutrition is especially complex, because it has medical, social, economic and psychologic aspects. In any community it requires the co-operation of all public and private agencies with a broad vision on the part of administrators, staff and especially family case workers as to the part that better food can play in improving the health of their clients. Many times they are so concerned with family relations and budget problems that there is little time or inclination to investigate the food used by the family.

In recent years a number of health programs in which nursing service is an important factor have been initiated throughout the country. These services may be under public or private auspices. Some public organizations, such as state, county and local departments of health and departments of education, may maintain nursing services. Many communities also have a visiting-nurse service under private auspices. The function of a public-health nursing service may be entirely educational, or it may be a combination of health education and bedside care. Checking the food habits of the family or the individual may disclose glaring deficiencies that might be corrected within the existing food budget.

The nurse has an opportunity to carry practical nutrition into many homes untouched by other services. She must be prepared to give necessary instruction in regard to food selection. She will handle few cases in which some improvement is not required. It is strongly recommended that a well-trained nutritionist be included on the staff of the larger organizations to serve as consultant and to plan a broad nutrition program in which public-health nurses may play an important role. In smaller communities where the nursing service cannot afford a full-time nutritionist, assistance and advice may be obtained through consultant services established by the local nutrition committee, by the Red Cross or by other community agencies. Nutrition research is advancing at such a rapid pace that the nurse needs the help of a specialist so as to keep in touch with new developments.

The nurse may be of great assistance in helping a patient to carry out the doctor's orders concerning special diets and to fit the diet into the family food plan. In assisting with such a program for one member of the family, improvement in

food selection for the family as a whole may result incidentally. Stern,[11] in describing the fundamental approach to the education of a clinic patient, says: "The fulfillment of the diet plan depends on the successful education of a patient in the principles underlying his diet. These must be presented to him clearly and simply." This also applies to the patient in the home. In many instances poor health that cannot be traced to any organic disease can be corrected by helping the patient to secure an adequate, normal diet.

To change ingrained food habits is usually a slow process, and improvements can be made only one at a time. It is a worth-while accomplishment, for instance, to induce a family to purchase an adequate amount of milk, since that in itself makes such a significant contribution to an otherwise poor diet. When money is scarce, it is particularly important to be able to guide families in the selection of foods that will provide adequate nutrition for all members at low cost. Instruction may be needed in the preparation of food, and these suggestions should be made in the light of the facilities available for cooking.

In certain circumstances the nurse may have a unique opportunity to promote better nutrition. She may be expected to make practical suggestions for securing the kind and the amount of food necessary during pregnancy and lactation (see Chap. 12). She may be called upon to help prepare the baby's formula and, later, to advise on the introduction of foods other than milk (see Chap. 13). Preschool and older children may need guidance in food habits, or the mother may have to be helped as to what foods to buy, how to prepare them and how to induce the children to eat the right food. When the children reach the high school age and begin to eat one meal away from home, good food habits established early count, but even then these children may need guidance on how to choose the best lunch for the limited amount that they have to spend (see Chap. 14).

Adults and older people often fail to realize that their health also may depend upon the habitual consumption of an adequate diet and that good food habits can delay the progress of senility in older people (see Chap. 15). During convalescence, when the period of acute illness is passed, the public-health nurse can be of great assistance in suggesting foods that will hasten recovery and help the patient to adjust to a normal diet again.

[11] Stern, F.: Applied Dietetics, Baltimore, Williams & Wilkins, 1949.

STUDY QUESTIONS

1. What are some of the signs of good nutrition in the individual? Of poor nutrition?
2. About when did the modern concept of nutrition as a science take shape?
3. What contribution has the United States made to the setting of standards for nutritional needs?
4. Which of the U.N. organizations are concerned with the food and the nutrition of populations?
5. What evidence is there of nutri-

tional deficiencies in the United States?

6. Why has there been some improvement in the American dietary in recent years? Has this been sustained in the past years? State the probable reasons for the changes that have occurred.

7. Numerous popular guides have been published to help laymen select better food. Which of these guides with which you are familiar have you found to be helpful to you?

8. Give scientific evidence that improvement of nutritional status is possible as a result of food enrichment.

9. Health departments have long been responsible for the prevention of communicable diseases. How will the addition of education in nutrition alter the programs of health agencies? With which groups is such education most effective?

Carbohydrates

WORLD USE OF CARBOHYDRATE FOODS
SUGARS OR SOLUBLE CARBOHYDRATES
SINGLE SUGARS
DOUBLE SUGARS
INSOLUBLE CARBOHYDRATES
STARCH
GLYCOGEN
CELLULOSE AND HEMICELLULOSE
METABOLISM OF CARBOHYDRATES
BREAD AND FLOUR ENRICHMENT

WORLD USE OF CARBOHYDRATE FOODS

"Bread, the staff of life" might be paraphrased as "carbohydrate, the fuel of life." Carbohydrate foods are the major sources of calories for all peoples the world over. They make up from 50 to 60 per cent of the American diet and a higher percentage for peoples in many other countries. They are the cheapest and most easily digested form of fuel for human and animal energy.

The natural sources and the form in which the common carbohydrate foods are used around the world throw light on the respective standards of living in various countries. A world food survey made by the FAO charts the foods used in 70 countries. Eastern Asia and eastern Europe derive over 80 per cent of their total calories from carbohydrate foods, grain and potatoes. In Asia the predominating grain is rice; in Europe, wheat with some rye in central Europe and oats in Scotland. Potatos are an important carbohydrate food in many countries, especially in Poland, Scandinavia and Russia. The Western world eats wheat in one form or another—bread, breakfast cereals, macaroni and spaghetti, with oats, corn and other cereals in lesser amounts. The American Indian and peoples of Central and South America make corn their "staff of life."

The word "cereal" is derived from Ceres, the mythologic goddess of grain and harvest, pictured by the Greeks as giving the first grain to man. Today, grains furnish about one-half the food calories for the world's people and a large proportion of the feed for farm animals. In general, the peoples of the western hemisphere eat fewer cereal products than those of eastern Europe and Asia.

The United States and Canada, along with certain western European countries and Australia and New Zealand, are the big consumers

of sugar in the form of candies, cakes, sugar and other sweets.

A food nutrient which assumes such importance in the maintenance of life on this planet demands further study. Carbohydrates are the chief form in which plants store potential energy. Carbohydrates are synthesized by plants from the water of the soil and carbon dioxide of the air with the help of the green cholorphyll in the leaves which allows them to harness the energy —light and heat—from the sun. This might seem like one of Nature's simplest processes, but actually the reaction is exceedingly complex, so obscure, in fact, that man has yet to understand and duplicate the chemical laboratory of the green leaf. The largest proportion of the sun's energy which is transformed into potential energy by plants appears in some form of carbohydrate, made up of the three elements: carbon, hydrogen and oxygen.

SUGARS OR SOLUBLE CARBOHYDRATES

The **single sugars** (monosaccharides) are the simplest and smallest carbohydrate molecule. They require no digestion and are readily absorbed from the intestine directly into the blood stream. Three single sugars are found in foods and are formed from other carbohydrates in the process of digestion: glucose, fructose and galactose. *Glucose*, also called dextrose, is abundant in fruits and vegetables. It is the form of carbohydrate to which all other forms are converted eventually for transport in the blood and for utilization by the tissues of the body. *Fructose*, also called levulose and fruit sugar, is found associated with glucose in many fruits and vegetables and especially in honey. It is responsible for the peculiar sweetness of honey. *Galactose* is not found free in nature but is derived from the double sugar lactose by digestion or hydrolysis. It is manufactured for experimental and therapeutic purposes. Sometimes it is used diagnostically by the medical profession to test the functioning of the liver.

The **double sugars** (disaccharides) commonly encountered in foods are sucrose (cane or beet sugar), maltose (malt sugar) and lactose (milk sugar). The double sugars may be split by acid hydrolysis outside of the body or by specific enzymes in the digestive tract into single sugars. Each of the three double sugars has distinct characteristics of interest in human nutrition. Although they are closely related in chemical structure, the slight difference in the way the hydrogen and the oxygen atoms are arranged around the chain of carbon atoms gives them distinct characteristics.

Sucrose, ordinary granulated, powdered or brown sugar, is one of the sweetest forms of sugar and costs the least. Consequently, it is consumed in greater quantities than all others, often to the detriment of health, because high concentrations of sucrose have an irritating effect on the tissues lining the alimentary tract and because sucrose tends to satisfy the appetite and thus reduce the consumption of other more necessary foods. Mo-

lasses, a by-product of sugar manufacture, and "raw sugar," the first crystallization, are crude forms of sucrose retaining some minerals and vitamins from the original sources. Blackstrap molasses is the darkest form and carries the most impurities. It also retains the highest percentage of minerals and vitamins, but the flavor is disagreeable to many people.

Maltose, or malt sugar, does not occur free in nature but is manufactured from starch by the action of diastase, a plant enzyme obtained from sprouting grains. Maltose is also an intermediate product in the digestion of starch and is easily utilized by the body. Often it is used in combination with dextrin in infant and invalid diets where it is desirable to have a soluble form of carbohydrate which does not readily ferment in the digestive tract.

Lactose, or milk sugar, is less soluble, less sweet and more slowly digested than the other two double sugars. When consumed in amounts greater than those ordinarily present in milk, some of it may not be digested. An undigested residue of lactose in the large intestine has a laxative action which may be desirable in certain instances but which, in excess, causes diarrhea. Lactose is an excellent medium for the growth of certain useful acid-tolerant types of bacteria and has been used therapeutically to increase this type of bacterial flora in the large intestines. Lactose also seems to increase the absorption or utilization of calcium, and often this finding is cited as the reason for the efficient utilization of calcium from milk. Sometimes lactose is given as an accompaniment of calcium salts prescribed for people who have an allergy to milk and must obtain their calcium in another form.

INSOLUBLE CARBOHYDRATES

For more stable and efficient storage of potential energy the plant world packs its fuel in larger units than the sugars: namely, starch, dextrin and cellulose. All of these are *polysaccharides,* the molecules of which may be several hundred times as large as those of the sugars. Consequently, they are much less soluble and more stable but differ markedly among themselves as to digestability and resistance to deterioration. Since there is so much moisture in all growing plants, one essential characteristic of a storage material is insolubility. To be suitable for a human food, however, a carbohydrate must be subject to digestion by the enzymes of the digestive tract. Starches and dextrins come in this category. Celluloses and hemicelluloses occur in foods but are more or less resistant to digestion. Wood fiber is poor food for man or animals but termites seem to be able to digest some of it. Of course, different woods vary in their resistance to decay. Thus, nature synthesizes all types of carbohydrate, from the very soluble, easily fermented sugar, to wood cellulose as resistant as the cedars of Lebanon or the redwoods of California.

Starch

The *starches,* found in grains, vegetables and other plant prod-

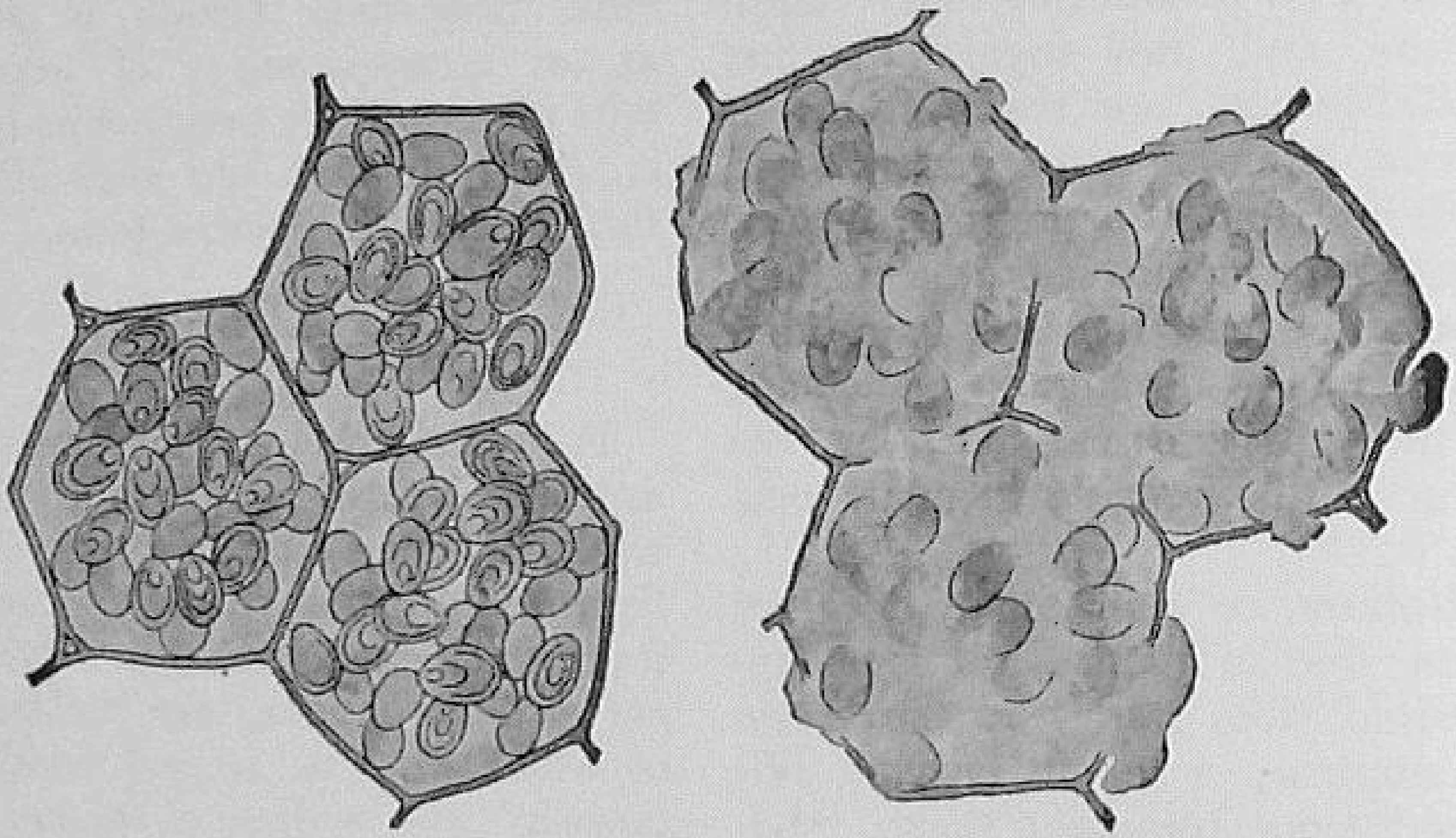


FIG. 4. Potato cells, showing starch grains as they appear raw and after cooking. Note the softened appearance and rupture of both cell walls and starch granules. (Broadhurst, Jean: Bacteria in Relation to Man, Philadelphia, Lippincott)

ucts, are among the most useful forms in which carbohydrates are stored. Starch usually is found in the plant encased in a cellulose wrapping, the cell wall, which is more or less resistant to digestion. The starch grain, or granule, consists of tiny particles of starch usually arranged in concentric layers or a pattern of characteristic shape and appearance. Thus, each kind of starch—potato, wheat, arrowroot, corn—can be identified by microscopic examination.

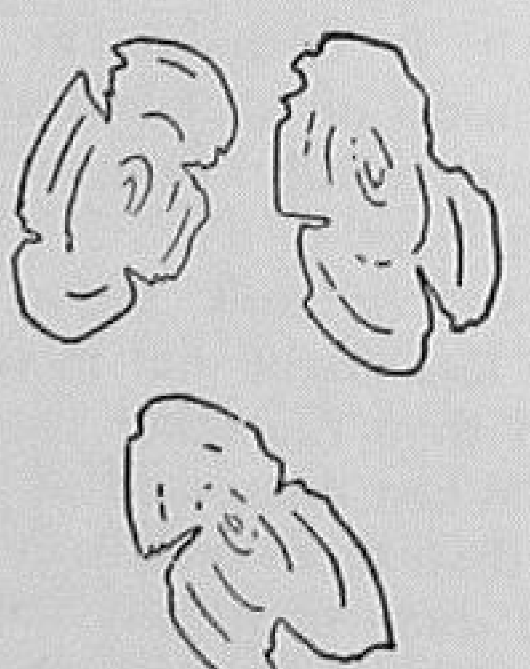


FIG. 5. Potato starch grains showing partial digestion by saliva. Whole grains shown in Figure 4. (Broadhurst, Jean: Bacteria in Relation to Man, Philadelphia, Lippincott)

Effect of Cooking and Digestion. Before starch can be used readily by the body, the outer membrane must be broken, either by grinding or cooking. By the application of heat and moisture the outer cellulose envelope is ruptured, and the moisture permeates the starch granules themselves. The starch granules have an affinity for water, absorbing it as a sponge, slowly at room temperature, rapidly at boiling temperature. Thus, a spoonful of dry cornstarch or flour dropped into cold water may be stirred to a smooth paste but when dropped into boiling water, it forms a lump because the

outer grains swell so rapidly that they form a jacket around the others. After rupture of the cellulose wall by cooking, the starch is in a form that can be acted upon by digestive enzymes (Fig. 4). There is some experimental evidence that the body can digest raw starch to a limited extent, probably after bacterial disintegration of the cellulose covering. The relative digestibility of starches from different sources has been the subject of some debate. Arrowroot, tapioca and sago may be digested more rapidly than starch from corn, wheat or rice, but the ultimate completeness of digestion probably does not vary greatly. The length of cooking time may also affect the rate more than the completeness of digestion.

After the rupture of the cellulose walls by cooking, starch may be acted upon by the ptyalin of the saliva. In salivary digestion starch passes through several stages: it is first transformed into soluble starch, then into a series of three or more intermediate products known as dextrins; and later into the sugar, maltose, an entirely soluble product. Accompanying each dextrin stage a small quantity of maltose is formed, the amount increasing gradually with each step in the process of salivary digestion. It is common knowledge that a piece of plain cracker or bread becomes sweet to the taste if chewed long enough; that is, if it is retained in the mouth a sufficient length of time to permit digestion to proceed to the maltose stage.

Cooking alone may carry the breakdown of starch to the dextrin stage, if continued long enough. Starch granules break down most rapidly when moisture is present. Long application of dry heat, such as in baking or toasting, will also change starch to soluble dextrins. The palatable flavor of the brown crust of rolls or bread or the brown part of toast or of toasted cereals is due partly to forms of dextrin. Sometimes dextrins are found free in nature, especially in cereals, but they occur more frequently as intermediate products in the change of starch to maltose as described above. Dextrins also occur as intermediate products in digestion of starch by malt enzymes used in making malt beverages and in certain other commercial processes such as the making of mucilages. The Government uses dextrin, made from cassava starch, in the manufacture of postage stamps.

Glycogen

A small amount of carbohydrate is stored in the liver and the muscles in the form of glycogen. The amount is so small that it is only a temporary source of fuel in the body between meals and is mostly used up in 24 hours if no food is eaten. Liver and deep-sea scallops contain the most of any familiar foods, ranging from 2 to 6 per cent. Factors controlling glycogen formation and breakdown in the body are of interest to the diabetic specialist because this mechanism helps to control the level of the glucose in the blood.

Cellulose and Hemicellulose

Cellulose and hemicellulose are the framework of plants. They are the chief constituents of wood, of stalks and leaves of all plants and

of the outer coverings of seeds and cereals. Fiber forms the more or less porous walls of cells in which water, starch, minerals and other substances are stored in the plant much as honey is held in the comb.

Fiber has little if any food value in the human body. Usually it is considered as an indigestible substance, but many individuals apparently utilize some of the more tender celluloses from green leaves and young shoots. No known enzyme secreted in the human intestine can digest cellulose, but bacterial fermentation or disintegration may play a role in dissolving the substances which bind together the cellulose fibers or particles. The degree of digestibility varies according to stage of growth, the type of plant and the amount of cooking. The cellulose of tender shoots may disappear completely from the intestinal tract.

The indigestibility of cellulose is its major asset, since the undigested fiber furnishes the bulk often necessary for efficient and normal peristaltic action (muscular contraction) of the intestines. The addition of cellulose to the diet in the form of bran is suggested sometimes in cases of chronic constipation due to lack of bulk. Other types of constipation, however, may be greatly aggravated by bran, which is known to be irritating to a particularly sensitive digestive tract. Research has demonstrated that the normal colon performs better when a reasonable amount of bulk or residue is present. Figures were derived from these studies as to the amount of cellulose, or indigestible fiber, that a normal person requires each day. One-fifth ounce has been suggested as an adequate daily allowance, to be increased or reduced according to individual requirements.

In order to make a quick, rough estimate of the fiber content of the diet, Stern[1] suggests the following averages:

Vegetables and fresh fruits:
 1 Gm. of fiber/100 Gm. (average serving)
Dried fruits:
 1.5 Gm. of fiber/30 Gm. (average serving)
Whole-grain bread and cereals:
 0.5 Gm. of fiber/30 Gm. (average serving)
Nuts:
 0.5 Gm. of fiber/30 Gm.

(For more nearly accurate figures on fiber content of common foods, see Table 1, Part Four.)

Agar-agar and pectin are hemi-

[1] Stern, F.: Applied Dietetics, Baltimore, Williams and Wilkins, 1949.

THE STORY OF FIBER IN THE BODY

IN FOOD	IN THE DIGESTIVE TRACT	IN EXCRETA
Cellulose in Vegetables Fruits Cereals Nuts	Functions chiefly as bulk Softened by digestive juices Stimulates peristalsis Small fraction digested by bacterial action and absorbed as glucose Largest proportion undigested passes into large intestine	Indigestible Residue in Stools

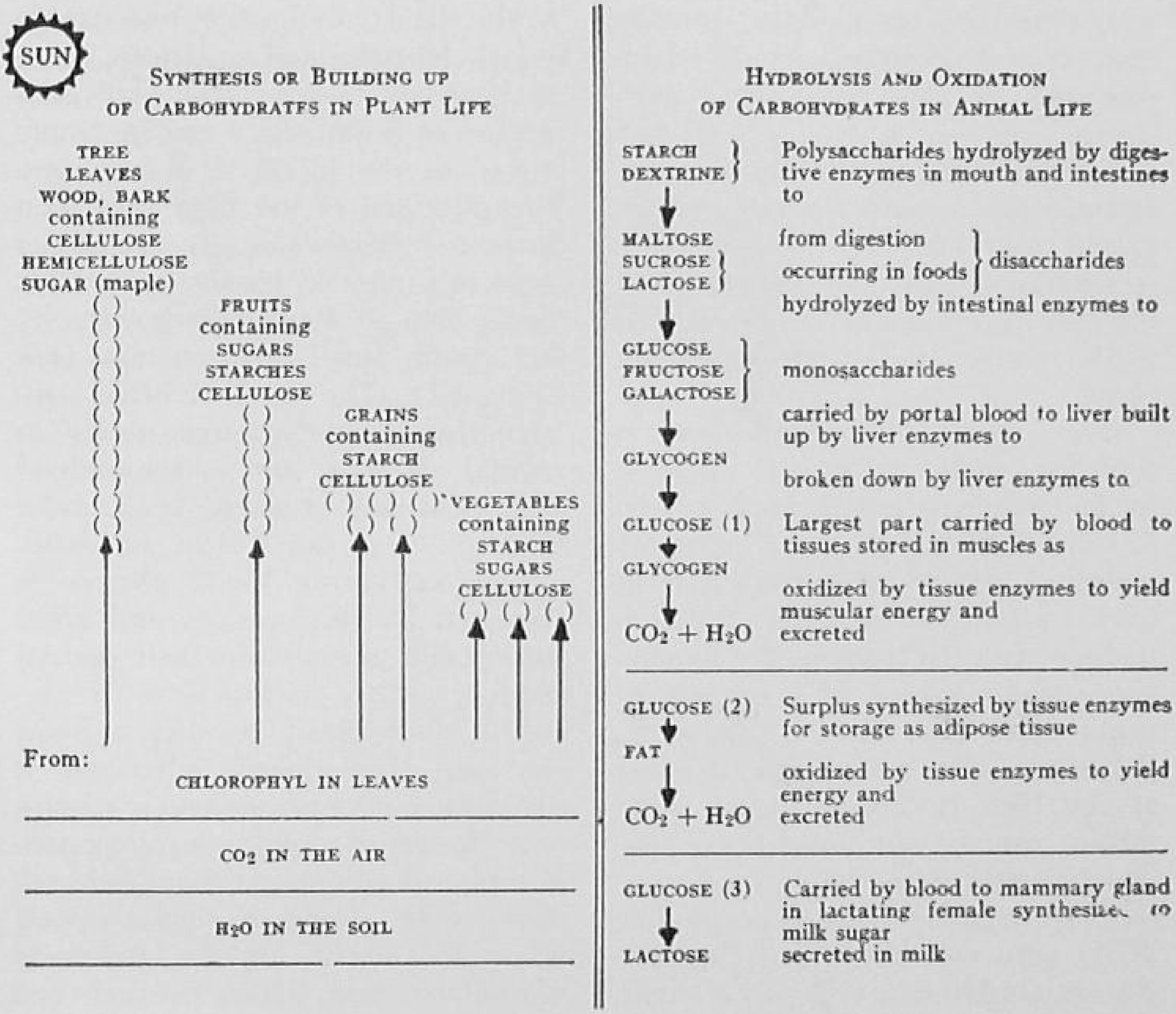


Fig. 6. Synthesis and breakdown of carbohydrates in plant and animal life.

celluloses, closely related to cellulose but slightly different in chemical structure. They have the ability to absorb many times their volume of water, thus forming jells. Because of this property agar-agar from seaweed has been used as a thickening for blanc mange and also as a therapeutic agent to increase the bulk in the intestine to promote the formation of a soft stool. Alginates, the active compounds extracted from seaweeds, are now used extensively in ice cream manufacture to give body and smooth consistency.

The pectins in certain fruits and fruit seeds are responsible for their jelling properties. Chemically, these pectins are complex compounds of several single sugar molecules. Commercial pectin, prepared from fruit seeds, is widely used for making jelly in the home as well as commercially. The colloidal property—the ability to form a jell—is increased in the presence of sugars.

The therapeutic value of pectin and pectin products in the treatment of diarrhea has been attributed to its capacity for absorbing toxins or neutralizing harmful substances produced by certain bac-

teria. Thus pectin tends to remove irritants and provide the bulk which promotes normal physiologic peristalsis.

Interrelationships among the different forms of carbohydrate are apparent from the foregoing discussion. A summary of the synthesis in plant life and the breakdown in the animal world is given in the accompanying chart.

Even within the plant there is transition from one form to another. In the maple tree the sugar of the sap is changed into the complex molecule, the polysaccharide, wood fiber, an indigestible form of carbohydrate. In such fruits as the banana the carbohydrate is in the form of starch while the fruit is maturing, but some of it is changed to sugar as the fruit ripens. In some vegetables, sugar synthesized by the leaves is stored as starch, as in mature beans, peas and corn. People like green corn and green peas because the carbohydrate is still partly sugar. Connoisseurs of fresh garden vegetables are aware of how quickly the sugar of corn and green peas disappears after harvesting, and how much more delicious they can be when used immediately after picking. This change is due to the enzymes that are present, and the change is stopped as soon as the enzymes are destroyed by cooking.

METABOLISM OF CARBOHYDRATES

The varied forms of carbohydrate that occur in foods must all be reduced to one form, glucose, before they can be utilized by the body. That is the purpose of digestion and the changes that take place in the liver. Even the two single sugars, fructose and galactose, must be changed to glycogen and later to glucose before they can be transported in the blood to the tissues. The glycogen of the liver is broken down and released as glucose at the exact rate needed by the body; this mechanism is controlled largely by the insulin from the pancreas (see Chap. 21). The level of blood glucose rises slightly after meals in normal persons but is maintained at a relatively constant level, from 80 to 120 mg. per 100 cc. of blood.

The circulating blood glucose is absorbed by the muscles and other tissue cells to maintain their normal reserve, mostly in the form of glycogen synthesized by the cellular enzymes. The muscle glycogen is the reserve fuel for muscular energy and forms a complex glycogen-phosphorus compound that can break down with almost explosive speed when the nerve impulse demands muscular action. Much research has been undertaken in an attempt to discover the exact nature of this chemical reaction, which creates motion in a manner utterly unlike anything that occurs outside of the body. Three vitamins of the B complex group are involved in the oxidation-reduction reactions of carbohydrates in muscle tissue. Muscular work is often compared with a mechanical engine, but all such comparisons fail to emphasize the fact that heat is a mere by-product of this reaction in the body rather than a means of producing it, as in an engine. To be sure, the heat that is produced is used to maintain body temperature.

When more carbohydrate than

the body needs for daily work is eaten, the extra is stored for future use. Glycogen in the liver and in the muscles is the temporary storage to carry from meal to meal and overnight. The real surplus carbohydrate is transformed into fat and stored as adipose tissue. An overliberal supply of carbohydrate in the diet continually is the chief cause of obesity.

Some carbohydrate is essential for the normal metabolism of other foodstuffs. Fatty acids do not oxidize as readily as do sugars in the body. When the body is called upon to burn fat in the absence of carbohydrate, a condition known as acidosis is apt to occur, because the products of the incomplete oxidation of fatty acids are acid in reaction and are toxic to the body. The glucose in the blood stream is used for still another purpose in the lactating female. When the mammary glands are active, lactose is synthesized from blood glucose by enzyme action in these glands.

Thus the carbohydrate cycle in nature starts with synthesis in the plants to become the fuel for animal life where by oxidation it returns to simple water and carbon dioxide as shown in the diagram (Fig. 6).

BREAD AND FLOUR ENRICHMENT

Since bread is one of the main sources of carbohydrate in the American diet, it may be appropriate at this point to mention the program of enrichment which was initiated in 1941. It is also relevant to note that the thiamine, the riboflavin, the niacin, and the iron used in the enrichment of flour and bread provide the B complex factors mentioned above as necessary for the metabolism of carbohydrate. Instead of using the natural grain, which contains a good balance of these factors, custom and preference have brought about the wide use of white breads. Considering human nature and the difficulty of changing food habits, enrichment was accepted as a step toward providing a good balance of factors necessary for the proper utilization of our chief carbohydrate food, bread. For a more complete discussion of enrichment see Chapter 48.

STUDY QUESTIONS

1. What does the expression "Bread is the staff of life" mean? What other forms of carbohydrate may form the bulk of the diet? In what countries?
2. How did the word "cereal" originate?
3. From what are carbohydrates synthesized by plants?
4. Name the single sugars and give some food sources for each.
5. What is the commonest disaccharide? In its usual form does it contribute anything besides calories to the diet? What other double sugars occur in food?
6. Where are starches found in food? Discuss the effect of cooking on starch.
7. What is "animal starch"? Where is it found? What is its importance?
8. Some polysaccharides are not digested. Which are they? In what foods do we find them? What is their function?

9. Why will eating more carbohydrate foods than the body needs result in weight gain?

10. What are the end-products of carbohydrate digestion? In what forms is carbohydrate found in the body? What are the end-products of the metabolism of carbohydrate?

CHAPTER THREE

Fat and Related Substances

FOOD FATS—DEFINITION AND CLASSIFICATION
THE NEED FOR FAT IN THE DIET
DIGESTION AND ABSORPTION
METABOLISM AND STORAGE
RELATED SUBSTANCES

FOOD FATS—DEFINITION AND CLASSIFICATION

The class of food constituents known as fats includes those which are fluid at room temperature, commonly called oils, as well as those which are usually solid and called fats. They all have similar chemical structure and properties. They are compounds of fatty acids and glycerol—a complex structure of carbon, hydrogen and oxygen—insoluble in water and greasy to touch.

There should be a clear distinction in everyone's mind between oils which are true fats and the hydrocarbon oils derived from petroleum, such as lubricating oil or purified mineral oil. The latter contain carbon and hydrogen but no oxygen. Mineral oil is completely indigestible in the animal body and cannot be classed as a food. Formerly, it was used in place of true fats in certain special low-calorie diets. This procedure should be discouraged because mineral oil tends to interfere with the absorption of all the fat-soluble vitamins. It is particularly detrimental when used in a food such as salad dressing or when taken with meals.

In natural fats there are a number of different fatty acids, which give to each its specific taste and texture. The fat of cold-blooded animals—fish, for example—is a soft fat which remains plastic in the low-temperature environment in which the fish live. The fats of warm-blooded animals have higher melting points but are also plastic at the body temperature of each species. As a rule, the fat of herbivorous animals is harder than that of the carnivorous. When adipose tissue of animals is subjected to heat, the fat liquefies and separates from the connective-tissue cells in which it was stored. Thus pork fat is "tried out" in the manufacture of lard.

For practical convenience, a distinction is often made between the food fats which are purchased or used as such—known as visible fats (butter, margarine, lard, salad oils) —and the so-called invisible fats which are a part of our natural foods (the fats of meat, milk, cheese, eggs, cereals, nuts). This distinction is not literally correct or always consistent. The butter or margarine in cake or a vegetable is

not visible, and the fat on a beef steak is visible, but we accept the classification for convenience.

The visible fats most used in the United States are lard, butter, margarine and cooking fats. The last two are made from the relatively less expensive vegetable oils, such as cottonseed oil, soy-bean oil, corn oil and cocoanut oil, by the process of hydrogenation. This chemical process involves the introduction of hydrogen into the fat molecule under carefully controlled conditions to produce a fat with exactly the right melting point and other properties for culinary purposes. Fat thus formed is homogenized to form a creamy smooth product, but evidence of its being a mixture is given by the grainy texture of such a fat once it has been melted and allowed to harden again—the high and the low melting point ingredients are no longer evenly mixed.

Margarine is processed largely from vegetable oils by hydrogenation and then churned with cultured milk to give the flavor of butter. It is usually fortified with vitamin A to the equivalent of average butter. Nutritionally, fortified margarine is practically the equivalent of butter, and the usual cost is about half. Discriminatory taxes on margarine are unfair because it is a wholesome and a nutritious product. Such laws are being rescinded in most states, and in most it may be sold in colored form.

THE NEED FOR FAT IN THE DIET

In normal times the average American eats about 100 pounds of fat a year, providing about one-third of his total calories. This figure includes both the visible and the invisible fat in about equal amounts. People who are accustomed to this amount of fat in their diet are quite unhappy when they cannot have it. The psychological value of visible fat in the diet is far greater than that of the hidden or invisible fat, although physiologically the latter serves the same purpose.

There is no physiologic proof that the human body needs as much fat as Americans consume, but it is recommended by experts that not less than 20 to 25 per cent of the total calories in the American diet should be in the form of fat. That this much fat is not a physiologic necessity for all people is demonstrated by the extremely low fat diets used by large population groups in southern and eastern Europe and in Asia. In eastern Asia, for instance, there is less than 5 per cent of visible fat in the diet as compared with three times that amount in the American diet.

Fats serve a multiple purpose in the diet. Some act as carriers of essential vitamins and all give satiety value to a meal. The satisfaction that fat gives in the diet is partially due to its slow rate of digestion and to the flavor it gives to other foods. It is difficult to prepare many favorite American dishes without fat. Thus the morale value of fats is always high. During both World Wars fats were in short supply, and there was more popular complaint about fats than about almost any other food, although there was no evidence of malnutrition.

An actual nutritional deficiency due to limitation of fat in the diet

is difficult to demonstrate, but it has been done experimentally with animals. Three fatty acids are now recognized as essential for growth and survival of an animal. These fatty acids cannot be synthesized within the body from other types of fatty acids; therefore, they must be present as such in food when consumed. They are arachidonic, linoleic and linolenic acids, the last two being so named because they were first discovered in linseed oil. They are now known to be constituents of most of the food oils, as well as of egg yolk, butter and the organs and the tissues of animals. The human requirement for these essential fatty acids is apparently small and ordinarily it is met easily in the average diet. The function of these essential fatty acids is not too well understood, but they appear to be necessary constituents of certain tissues such as nerve cells and glands.

DIGESTION AND ABSORPTION

Fats require special digestive action before absorption because the end products must be carried in a water medium, blood and lymph, in which fats are not soluble. All fats are finely emulsified in the intestines by the action of the bile and the bile salts. Part of the emulsified fat is split by enzyme action into fatty acids and glycerol. Lipase is the term applied to an enzyme which splits fats. A gastric lipase may digest some of the fats already in an emulsified form in foods such as cream and egg yolk. The more active enzyme is pancreatic lipase, found in the small intestine, which can split the fat that has been emulsified by bile action. The increase in surface area affected by emulsification is enormous and thus gives the enzyme a better chance for action. The emulsification also makes possible the absorption of some of the undigested fat globules, as well as the fat-soluble vitamins, directly into the lacteals.

The portion of the fat which is split by enzyme action may be absorbed either via the lacteals into the lymphatic system or directly into the portal blood via the intestinal capillaries. (See diagram, FIG. 7.)

In either case the present concept is that fatty acids and glycerol reunite to form neutral fat during the passage through the intestinal wall. The mixing of fatty acids from various food sources and from stored fat makes possible the synthesis of fats needed for specific tissues. Some of the fat combines with phosphate radicals to form phospholipids. Fats and phospholipids which are absorbed via the lacteals are transported as an emulsion in lymph via the thoracic duct to the left subclavian vein in the left shoulder, where the lymph flows slowly into the rapidly moving blood stream. The blood then carries the fat compounds to all the tissues.

The digestibility of fats varies to some extent; the softer fats—those with the lower melting point—are digested more completely by man than those with the higher melting points. Butterfat, with a melting point of 32° C., is digested with a loss of only 3 per cent; beef fat, with a melting point of 45° C., with

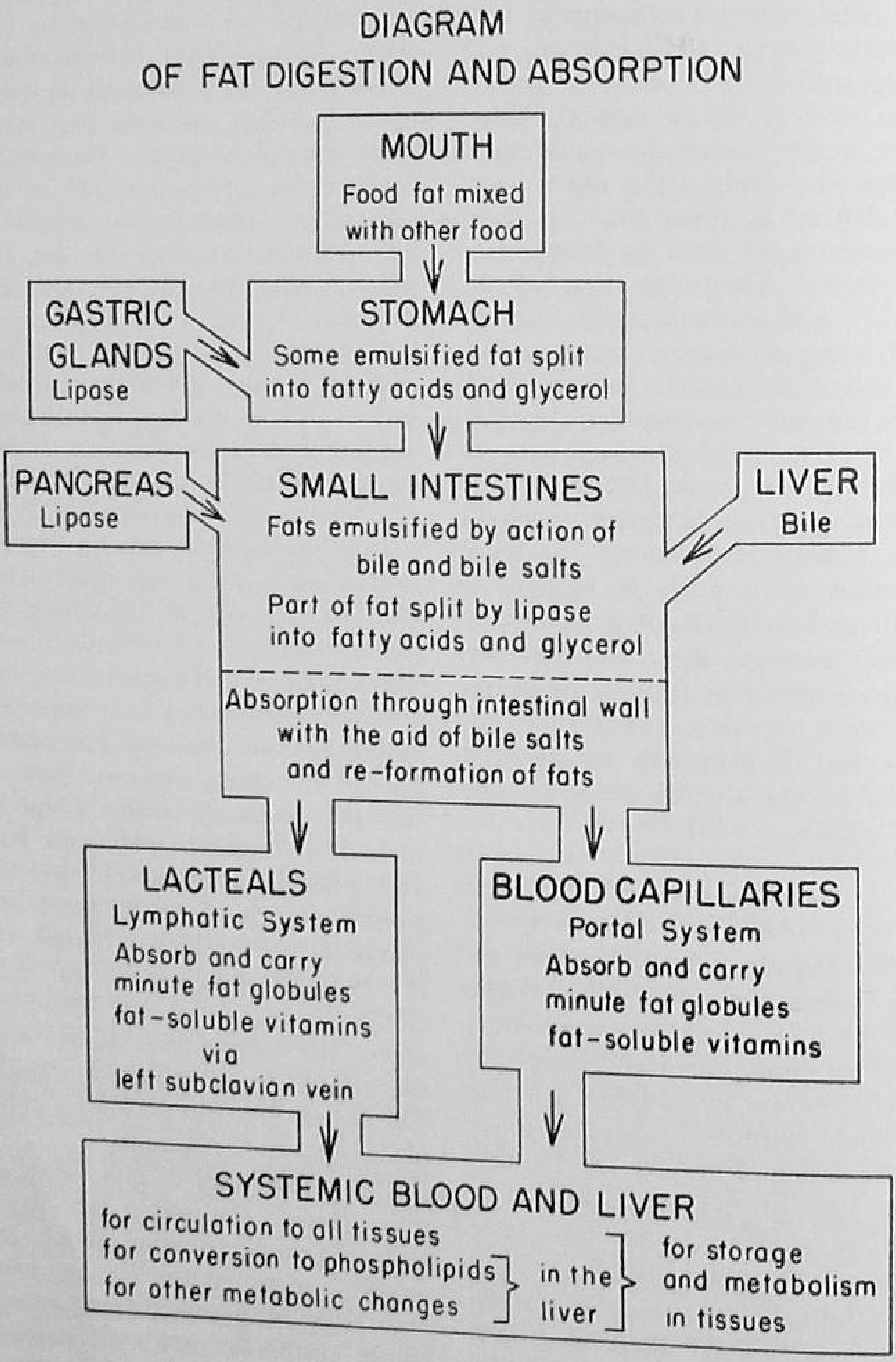


DIAGRAM
OF FAT DIGESTION AND ABSORPTION
MOUTH
Food fat mixed
with other food
GASTRIC
GLANDS
Lipase
STOMACH
Some emulsified fat split
into fatty acids and glycerol
PANCREAS
Lipase
SMALL INTESTINES
Fats emulsified by action of
bile and bile salts
Part of fat split by lipase
into fatty acids and glycerol
LIVER
Bile
Absorption through intestinal wall
with the aid of bile salts
and re-formation of fats
LACTEALS
Lymphatic System
Absorb and carry
minute fat globules
fat-soluble vitamins
via
left subclavian vein
BLOOD CAPILLARIES
Portal System
Absorb and carry
minute fat globules
fat-soluble vitamins
SYSTEMIC BLOOD AND LIVER
for circulation to all tissues
for conversion to phospholipids
for other metabolic changes
in the
liver
for storage
and metabolism
in tissues

FIGURE 7

a loss of 7 per cent; but with mutton fat, having a melting point of 50° C., there is a loss of 12 per cent in digestion.

Foods which are surrounded by coatings of fat, especially if the food is saturated to any extent, as in the case of some fried foods, are often much delayed in their passage through the stomach. Cooking of the fats at high temperatures sometimes reached in frying brings about changes which make digestion more difficult. The glycerol of the fat may break down into irritating substances, and some changes may occur also in the fatty acids when subjected to high temperatures. For these reasons and because they may introduce an excess of fat, fried foods usually are withheld from sickroom dietaries. The temperature of the fat used in frying should be controlled carefully.

METABOLISM AND STORAGE

To a certain extent, fats and carbohydrates are interchangeable as sources of energy. Both yield energy when oxidized by the tissues. However, their oxidation proceeds along different lines. The utilization of carbohydrates was described in the previous chapter.

Fats are more concentrated than carbohydrates and when oxidized yield 2¼ times as many calories per unit of weight. Fatty acids have a greater concentration of carbon and therefore yield more energy. Even so, fat foods are a more expensive source of calories than carbohydrate foods—a fact reflected in the low consumption in countries where people are living on a low economic level.

During metabolism, fatty acids and glycerol follow different paths in the process of oxidation. The fatty acids are broken down by several stages to smaller molecules, and eventually to carbon dioxide and water, with the release of energy. The glycerol fraction is oxidized through some of the same stages as the carbohydrates.

In certain diseases the intermediary products of fat metabolism, namely, acetone, diacetic acid and beta-oxybutyric acid, may be produced in such quantities that their further metabolism to carbon dioxide and water cannot keep pace with their production. They increase in the blood stream and may be excreted in the urine. The volatile member of the group—acetone—may give rise to a characteristic odor of the breath. The chemical structure of two of these compounds classifies them as ketones and is the basis for the term *ketosis*. Two of these ketones have acid properties and, therefore, another term for this condition is ketone acidosis. Ketosis may occur in severe cases of diabetes, also in starvation when the body is burning its own fat (Chap. 20).

The fat not needed for immediate use is stored in the body depots as adipose tissue to be drawn upon in any emergency. Body fat may also be formed from carbohydrates (Chap. 2) and to a lesser extent from the proteins. This storage of fat is valuable in assisting in the regulation of the body temperature, as the layer of fat beneath the skin acts as a nonconductor and prevents excessive

radiation or loss of body heat. It also serves to protect the body from mechanical injury and acts as a support to vital organs, particularly the kidneys. Too great a deposit, on the contrary, may put an unnecessary burden upon the heart and other organs.

The relatively high consumption of fat in the United States and certain other countries may predispose to obesity, not because fat foods necessarily produce fat but because people who eat a high fat diet can overstep so easily their caloric needs. On the other hand, when a high caloric diet is necessary for therapeutic purposes it cannot be accomplished without a generous amount of fat.

RELATED SUBSTANCES

In addition to fats, the phospholipids and the sterols play very important roles in metabolism. The *phospholipids* are compounds consisting of a fat to which is attached a phosphoric-acid radical and a nitrogen-containing base. Two of the most important of this group are lecithin and cephalin, both cellular constituents. The phosphoric acid part of these compounds probably takes part in certain stages of carbohydrate metabolism. Lecithin, a water-soluble derivative of fats, undoubtedly plays an important part in fat metabolism, but exactly how and to what extent have not been determined. Choline, a part of the lecithin molecule, is now known to be essential to the prevention of fat accumulation in the liver, a condition known as "fatty liver disease." Other substances have been found to participate in preventing fat deposits in the liver. The phospholipids occur in relatively large amounts in the brain, the liver, the heart, the kidney, the lungs and, to a lesser extent, in all voluntary muscles. Egg yolks are also a rich source.

The *sterols* are alcohols containing four benzine rings and are soluble in fat solvents. Among the most important sterols are cholesterol and ergosterol. Cholesterol is found in all body tissues, especially in the brain and the nerve tissue, the suprarenal gland, the liver and the blood. It is synthesized within the body in sufficient quantities to meet metabolic needs. The amount in the blood is largely independent of the cholesterol in the food, but it may be increased on a high fat diet. Blood cholesterol higher than normal seems to be correlated with hardening of the arteries in middle age. Hypercholesteremia may also occur in nephrosis and diabetes.

Cholesterol is excreted from the body by way of the bile. When the mechanism for disposing of it is inadequate, cholesterol may appear in gallstones.

Closely related to cholesterol is ergosterol from plant sources. Both of these are precursors of, and may be converted into, vitamin D by means of irradiation with ultraviolet light (Chap. 7).

STUDY QUESTIONS

1. Name five foods which consist in large part of fat. Name five other foods also containing considerable amounts of fat, so-called "invisible."

2. Are fats a cheap or expensive food source of calories?

3. What substances are called "oils" which are not true fats?

4. Mineral oil was popular for a number of years as a substitute for fat on low-calorie diets. Why is this not advisable?

5. How are cooking fats and margarine manufactured? Does this process alter their food values?

6. What is added to margarine to give it the flavor of butter? What is added to make it nutritionally equal to butter?

7. There are three "essential" fatty acids. Are these freely distributed in foods containing fat? Do we have any deficiency of these fatty acids commonly occurring in man?

8. What are the end-products of fat digestion? What are the pathways of absorption? What are the end-products of fat metabolism?

9. In some diseases there may be an accumulation of partially metabolized fats. What are these called? How may they be detected?

10. Besides its use for energy, what other functions does fat perform in the body?

11. What are phospholipids? Sterols? Where are they found in the body? What sterols may be converted to vitamin D?

Proteins

IMPORTANCE AND WORLD USE OF PROTEIN FOODS
COMPOSITION AND ORIGIN OF PROTEINS
AMINO ACIDS
QUALITY OF PROTEINS
FOOD SOURCES
PROTEIN METABOLISM
PROTEIN REQUIREMENTS

IMPORTANCE AND WORLD USE OF PROTEIN FOODS

Every animal, including man, must have an adequate source of protein in order to grow or maintain itself.

Proteins have long been recognized as the fundamental structural element of every cell of the body. More recently specific proteins and protein derivatives have been recognized as the functional elements in certain specialized cells, glandular secretions, enzymes and hormones. Thus protein well deserves its name, which is of Greek derivation, meaning "of first importance." Since proteins are the principal constituents of the active tissues of the body, and since the body is dependent upon food protein for these indispensable substances, the quality and the quantity in the daily diet are of prime importance.

In many parts of the world, food sources of protein, especially good protein, are extremely scarce. There is some evidence that in countries where the quality and the quantity of protein are inadequate, the stature of whole groups of people may be affected. Peoples depending largely on plant sources of protein with little if any animal foods tend to be short in stature. It is well known that most Orientals and Indonesians are short; also, the average stature of the peoples in the Mediterranean area is less than that of northern Europeans. A study of Orientals who have lived in California for a generation or more has demonstrated a marked increase in stature—evidence that heredity was not the only determining factor. On the other hand Australians and New Zealanders have large and strong physiques and they are probably the heaviest meat eaters on the globe.

The United States has ample sources of protein, and the average person consumes an adequate amount. However, even in this country there are some people who, for economic or other reasons, may not get enough protein.

COMPOSITION AND ORIGIN OF PROTEINS

Proteins, as well as fats and carbohydrates, are composed of carbon, hydrogen and oxygen, but in addi-

tion they contain nitrogen, usually sulfur and phosphorus and sometimes iron. Chemically pure proteins are fairly stable, but in a moist state in which they generally are found in foods they decompose readily at room temperature. This spoilage is due to bacterial action and may form substances toxic to the body. In this respect, nitrogenous foods are more unstable and will decompose more readily than carbohydrates and fats. Therefore, protein foods such as fresh meat, fish, milk and eggs should be kept in the refrigerator to prevent or delay their decomposition.

Plants can synthesize protein elements from the nitrates and the ammonia in soil and in decaying vegetable matter, along with water and carbon dioxide from the air. Animals are dependent upon plants for this synthesis because animal cells cannot utilize the simpler forms of nitrogen. Animal metabolism of protein eventually yields the forms of nitrogen which the plant alone can utilize. Frequently, this sequence of events is called the nitrogen cycle.

AMINO ACIDS

Proteins are made up of nitrogen-containing compounds known as amino acids, held together in a chain-like chemical structure. Proteins are among the most complex organic compounds found in nature and have molecular weights ranging from 35,000 to several millions.

The first one of the amino acids was discovered over 125 years ago, but the last of the 22 listed below was isolated and identified in 1935 by W. C. Rose. During the century between these discoveries much of the basic chemistry and physiologic significance of proteins came to be understood. With the realization that amino acids were important factors in determining the value of proteins, many investigations were conducted to find out which of these amino acids were indispensable and which could be excluded safely from the diet without interfering with normal growth and body function. Most of the fundamental research was done with experimental animals, the pioneer work by Osborne and Mendel, and much of the later work by Rose, a former student of Mendel.

According to Rose[1] and later studies by Albanese[2] on infants, there are ten essential and twelve nonessential amino acids for growth. These are as follows:

Classification of Amino Acids with Respect to Their Growth Effects

Essential	*Nonessential*
Lysine	Glycine
Tryptophan	Alanine
Histidine	Serine
Phenylalanine	Norleucine
Leucine	Aspartic acid
Isoleucine	Glutamic acid
Threonine	Hydroxyglutamic acid
Methionine	Proline
Valine	Hydroxyproline
Arginine*	Citrulline
	Tyrosine
	Cystine

* Arginine can be synthesized by the animal organism, but not at a sufficiently rapid rate to meet the demands for normal growth.

Subsequent work on human subjects has demonstrated that only

[1] Rose, W. C.: Physiol. Rev. 18:109, 1938.

[2] Albanese, A. A.: Clinical Nutrition 1:44, 1952

eight of the ten amino acids listed as essential for growth are required for maintenance of nitrogen equilibrium in man. (Nitrogen equilibrium means that the loss of nitrogen in the excreta is approximately equal to the intake of nitrogen in the food.) Histidine and arginine are of doubtful significance for the adult human, but they are necessary for growth of children, as they are for growth of animals. Work is being continued to determine the daily requirements of the amino acids necessary for growth and maintenance in humans. Such findings will be of practical value in calculating protein requirements when the protein is drawn from widely varied food sources.

A man may be maintained in nitrogen equilibrium on a mixture of pure amino acids. This fact changes our earlier concept of the place of protein in the diet. Strictly speaking, it can be said that not only is protein, as such, necessary for life, but that essential amino acids also are necessary. National proteins may be hydrolyzed by the action of enzymes or acids to form protein hydrolysates, mixtures of the amino acids present in the protein. The use of protein hydrolysates is limited largely to emergency intravenous feeding. Usually they are unpalatable for oral use and tend to disturb digestion. Earlier attempts to use protein hydrolysates after prolonged starvation met with discouraging results.

QUALITY OF PROTEINS

Proteins in natural foods differ widely in the number and the proportion of the 22 or more amino acids that they contain. A good-quality protein or a complete protein is one that supplies all the essential amino acids in sufficient quantities for normal growth and maintenance. When tested experimentally, proteins such as ovovitellin from egg yolk or lactalbumin from milk are capable of supporting growth in young rats when fed at a relatively low level in the ration. This indicates that they top the list of good-quality proteins. In general, all proteins from animal sources, such as meats, poultry, fish, eggs, milk and cheese, provide good-quality proteins in liberal amounts (Fig. 8). The exception to this is the pure protein—gelatin—derived from animal connective tissue, an example of incomplete protein.

Proteins from plant sources are not usually of as good quality as those from animal sources. The amino acid structure of plant cells naturally differs from that of animal cells. The best quality plant proteins are found in legumes, such as all beans, peas and peanuts and in nuts. Proteins in certain green leaves and vegetables are good in quality but extremely limited in quantity. Grains in general contain rather poor quality protein.

A protein which can support neither growth nor maintenance in an experimental animal is called incomplete. One which can support maintenance but cannot promote growth is sometimes called partially incomplete. Usually, more than one protein is present in a single food such as corn. Zein, one of the proteins of corn, is a classic example of an incomplete protein. Zein lacks two of the essential amino acids.

Family planning places the responsibility on the whole group. It is not the fault of one person but the fault of all if the spending does not bring the satisfaction expected. Concern with getting your money's worth out of services and things you buy becomes more real if you share the responsibility for the purchases.

A better understanding of family finances comes through family planning. Most of us know many, many things we want. If we help in the family planning, we also know just what money the family receives that may go for all the wants and needs of all its members. One girl who shared for the first time in the family planning said, after there was a discussion of family needs and money, "But where is the rest of our money—to do with what we please?" When she found that there was no special source for extra money, she was at first disappointed. We all find it hard to give up our belief in fairies and *easy money*. Helping plan the family's spending helps us to grow and to understand that all family spending is for our benefit, too.

Family planning makes for working together with satisfaction on the part of the family members. If we understand what the situation is, we are interested in helping. We are eager to work together. The money problems are not "father's and mother's," but the whole family's, and their solution gives satisfaction to all the members.

Family planning helps bring about the growth and development of the family members. Do you see how this can be? The five-year-old who shares in one of the planning sessions may understand far less than does the thirteen-year-old, but he learns that his family works together, that its members are thoughtful in their consideration of problems, and that they willingly adjust for the good of all. The thirteen-year-old may understand far less than her parents do about the whole matter of family finances, but her understanding is far greater than that of her five-year-old brother. She has learned the difficult lesson that if you have four apples and eat two, you then have only two ap-

Young rats cannot grow or even survive when zein is the sole source of protein in their diet. Gliadin from wheat is another incomplete protein.

Fortunately, most of our foods contain a mixture of proteins, one of which often supplements another. More to the point is the fact that we combine several foods in a meal, and the proteins from different types of foods tend to supplement each other. Cereals which lack one or more of the amino acid "building stones" usually are eaten with milk, which provides a complete protein containing the "building stones" lacking in the cereal. Therefore, it is obvious that a varied diet is much to be preferred to a restricted one.

FOOD SOURCES

Proteins are found both in animal and in plant foods, as is evident from Figure 8. Animal products in general provide more protein per serving as well as more complete protein. The best-quality proteins from plant sources are found in legumes, nuts and green leaves, as mentioned previously.

Cereals, while containing not more than 12 per cent of protein, and that not of the best quality, make a worth-while contribution to the protein intake because of the liberal amounts used. Cereal products may contribute more than one half the protein in certain countries where foods of animal origin are scarce.

Proteins are somewhat modified in physical properties and in physiologic availability by heat. In ordinary cooking, proteins such as those in egg, meat and fish are coagulated by heat. Low-temperature cooking produces a tender product, while high temperatures tend to cause toughening. An egg cooked below the boiling point is more tender than a "boiled" egg. Meat-cookery experts recommend temperatures between 300 and 350° F. for the best results, for the same reason, as well as to lessen shrinkage. The nutritive value of soy-bean protein is improved by autoclaving soybeans before processing as flour or grits. On the other hand, the high temperatures used in processing certain ready-to-eat cereals reduces the protein value by the destruction of one or more amino acids.

The percentage of protein in cooked foods, either meat or vegetables, depends upon the amount of moisture that may have been added or lost in cooking. Compare the protein content of rare and well-done meat and the protein content of raw and cooked oatmeal, raw and French-fried potatoes. (See Table 1, Part Four.)

PROTEIN METABOLISM

The digestion of protein in the alimentary tract is accomplished by the action of the three proteolytic enzymes—pepsin, trypsin and erepsin (Chap. 8). The end-products of this enzymatic hydrolysis in the stomach and the intestines are the 22 amino acids with sometimes small traces of dipeptides (compounds of two amino acids) that escaped being split apart. The amino acids are absorbed directly into the blood stream through the intestinal capillaries and are carried by the portal blood first to the liver and then to all tissues and organs of the body.

The body makes such combina-

tions of these amino acids as are necessary to build up its own kind of body protein, provided that the essential amino acids are present all at once in adequate amounts. No two types of tissue have exactly the same composition; muscle, liver, kidney, blood, skin, etc., must each have the specific types and amounts of these "building stones" to complete its structure or replace used materials.

Enzymes, hormones and internal secretions each contain combinations of specific amino acids or their derivatives. The specificity of function of amino acids is gradually being disclosed. Tyrosine and phenylalanine are necessary constituents of thyroxin—the endocrine secretion of the thyroid gland. Histidine is essential for the synthesis of histamine, a regulatory compound in the blood stream. Insulin demands seven specific amino acids for its synthesis by the pancreatic cells. The simple amino acid glycine can combine with certain toxic substances to make them harmless until excreted.

By ingenious research methods it has been demonstrated that a tissue must have all of the essential amino acids for a particular job—cell growth or tissue synthesis—presented to it by the blood stream at the same time. A missing amino acid cannot be supplied several hours later and find the other essential ones on the job waiting until all can be assembled. This fairly recent finding emphasizes the need for protein of good quality, providing all essential amino acids, at every meal.

After the blood stream has delivered the requisite amino acids to the various tissues and has collected the discard or surplus amino acids from the tissues, it carries them back to the liver. Neither surplus protein nor amino acids can be stored to any extent in the body. The liver serves as a redistribution and disposal center for amino acids. Those not needed are deaminized; that is, the nitrogen part (NH_2) is split off, and the nonnitrogenous part is used along with sugars and fats for fuel. Slightly more than half of the protein molecule may be converted into sugarlike compounds (glucogenic) to be used as an immediate source of energy, stored as glycogen or converted into fat for storage as adipose tissue. The ultimate end products of the oxidation of this portion of the protein molecule are CO_2 and H_2O, the same as for fat and sugar.

The nitrogenous portion of the amino acids split off by enzyme action in the liver may be used again in the resynthesis of certain simple amino acids needed by the body, or it may be discarded. The largest proportion is waste nitrogen, and most of it is formed into the simple compound urea by the liver cells and in that form is transported by the blood to the kidneys for excretion. A diagrammatic representation of the fate of protein in metabolism is shown in Figure 9. A careful study of this diagram, along with reading of the text, may help to clarify this story.

More complex protein derivatives give rise to other nitrogenous endproducts in the urine—uric acid and creatinine.

Protein is more complex than the preceding paragraphs may imply. All body tissues are constantly undergoing metabolic changes, sometimes

METABOLISM OF FOOD PROTEIN

COMPLETE ← PROTEINS → INCOMPLETE

AMINO ACIDS (including all essential ones) ← hydrolyzed by digestive enzymes → AMINO ACIDS (some of the essential ones may be lacking)

Absorbed into blood stream
in walls of intestines
Carried by portal blood to liver
↓
Released to blood as needed to be
carried by blood and lymph
Absorbed by tissue cells for use as
CELL PROTOPLASM
BLOOD AND LYMPH PROTEINS
HEMOGLOBIN
HORMONES
ENZYMES
SECRETIONS
Surplus discarded as AMINO ACIDS
Carried by blood stream back to liver
Deaminized by enzyme action mostly in liver

NITROGENOUS FRACTION (NH_2) changed by liver to
↓
UREA
↓
Carried by blood to kidney excreted in urine

NONNITROGENOUS FRACTION (GLUCOGENIC—58%)

- Small fraction ↓ combined to form simple AMINO ACIDS needed by body
- Stored as liver or muscle GLYCOGEN changed to GLUCOSE oxidized to $CO_2 + H_2O$
- Stored as BODY FAT oxidixed to $CO_2 + H_2O$
- Oxidized in tissues to $CO_2 + H_2O$

FIGURE 9

FIG. 10. Adequate and inadequate protein (18 per cent vs. 4 per cent). Rats of the same litter. This deficiency produces stunted growth but no deformities.

referred to as wear and tear. The body cells are not stable chemical combinations that remain static once they are formed. Modern research has demonstrated that all tissues are in a state of dynamic equilibrium, which means that they maintain a constant composition while certain components are breaking away and being replaced by others derived from food or the body's current surplus.

The very nature of the chemical processes involved in the metabolic breakdown indicate that protein is not an economical fuel food. Furthermore, the specific dynamic action of protein, explained briefly in Chapter 5, means that the body is stimulated to spend more energy as a result of protein ingestion. However, from a practical point of view, man's choice of food protein should provide an intake well above actual needs to make sure of an adequate supply of the essential amino acids. The necessary margin of safety means that usually there will be a surplus that must be deaminized and used like a fuel food, as surplus scrap wood left from building a house may be used for fuel, although the original material was not procured for that purpose.

PROTEIN REQUIREMENTS

Any quantitative estimate of protein requirement must take into account the quality of proteins involved. The Food and Nutrition Board recommends 70 and 60 Gm. of protein per day for men and women, respectively (i.e., from 10 to 15 per cent of the total calories or 1 Gm. per Kg. of body weight per day). The allowances for growing children are higher per unit of weight to meet the needs for growth. The pregnant woman and the nursing mother naturally need an extra supply to provide for the nourishment of two organisms. (See Recommended Dietary Allowances, Chap. 9.)

The trend at the present time is toward an increasingly liberal protein allowance for all ages, to provide for less obvious needs as well as for growth and maintenance. It is suggested, for instance, that a liberal protein intake tends to increase immunity or resistance to infections. However, experimental evidence and the results of wartime restrictions indicate that the human body has an ability to adapt itself to widely different protein levels of intake. Scientific observations of people living on drastically limited food supplies, low in protein and of poor quality, during World War II afford further evidence regarding the amazing human adaptation to such restrictions.

In ordinary peacetime circumstances and with a moderate income, the average person is apt to meet his protein requirement without difficulty. It is considered highly desirable for at least one third of the protein to be derived from animal sources, and the recommended allowances make this assumption. It is also recommended that some source of good protein be included in each meal for reasons stated earlier in this chapter. Since protein foods of high biologic value are the most expensive class of foods in the diet, there is a tendency among some low-income groups to consume less than recommended amounts of protein and often of poorer quality. From the chart (Fig. 8) it is easy to estimate

BASIC DIETARY PATTERN

FOOD FOR ONE DAY	MEASURE	APPROXIMATE PROTEIN CONTENT GM.
Milk or equivalent	1 pint	17
Vegetables:		
Potato	1 small	2
Green, leafy, yellow	½–⅔ cup	2
Other types	1–1½ cups	4
Fruits:		
Citrus	½ cup	1
Other	1 cup	2
Egg	1	6
Lean meat or alternates	3½ oz. cooked	25
Bread, whole grain or enriched	3 slices	7
Cereal, whole grain or enriched	½–⅔ cup	2
Butter or margarine	1 tablespoon	..
Total		68

the number of servings of protein foods necessary to meet the day's recommended allowance.

A basic dietary pattern for one person for a day is often used in planning menus for institutions such as hospitals. This dietary pattern, planned for an average person, provides a liberal amount of protein, more than half of which is from animal sources.

The protein requirement may be modified by certain pathologic and environmental conditions. Physiologically, hard physical labor increases caloric but not protein requirements. However, in actual life, men engaged in heavy work want protein foods as part of their extra calories, and this means that the protein intake is more than that recommended for active men. During convalescence from debilitating diseases or from surgery, extra protein seems to hasten recovery and the regaining of strength. In cold climates a higher protein intake may be desirable due to the specific dynamic action which tends to increase body-heat production. The earlier tendency to reduce protein intake in many diseases has been rather generally reversed, with a few exceptions, due to recent favorable results from the use of more liberal protein diets.

The history of investigation into human protein requirements abounds in contrasting opinions. Early investigators of the subject advocated from 100 to 150 Gm. of protein as a daily optimum, the figures being based on observations of what people were actually eating. The estimates tended to be high because meat consumption was liberal in the eighteenth century in central Europe where these scientists were living. Early in this century, Chittenden, at Yale, conducted a scientific study on

a number of students and faculty and found that they could remain in nitrogen equilibrium on less than a third of the amount of protein previously considered necessary. Other investigators championed the cause of low protein, believing that the products resulting from protein metabolism, in excess of actual body needs, were harmful. More recently, the emphasis has been on an adequate supply of good-quality protein well above the minimum requirement as measured by nitrogen-balance experiments.

STUDY QUESTIONS

1. Why is good quality protein important for breakfast as well as for other meals?

2. For what specific purposes are proteins used in the body?

3. Why must protein foods be stored in a refrigerator to prevent spoilage?

4. The structural components of proteins are amino acids. How many of these are known? Are they all essential for growth and maintenance of the body?

5. What do we mean by the term "essential amino acid"? Give an example of the relationship between amino acids and some of the hormones.

6. Why are most Australians and New Zealanders taller than most Indonesian and Mediterranean peoples? How has it been shown that this difference in the height is due largely to the type of protein each gets in his diet?

7. What are the food sources of complete proteins? What plants provide good food sources of protein? Compare the quality of protein from plant and animal foods.

8. What is the effect of heat on protein? What caution should be observed in the cooking of protein foods?

9. Trace the pathway of proteins through digestion and metabolism. What part does the liver play in protein metabolism? What are the end-products of protein metabolism? How are these excreted from the body?

10. What are the National Research Council recommendations for protein? What foods must be included in the daily dietary, and how much of each, in order to ensure good nutrition?

11. The so-called high-protein foods listed in Figure 8 contain appreciable amounts of other food constituents. Look up each of the foods listed and tabulate its fat and carbohydrate content.

CHAPTER FIVE

Energy Metabolism

ENERGY AND HEAT
MEASURING FOOD CALORIES
MEASURE OF ENERGY EXPENDED
BASAL METABOLISM
VARIATIONS IN RATES
WORK AND FUEL REQUIREMENTS
OTHER FACTORS AFFECTING TOTAL METABOLIC RATE

Of all the sun's energy that reaches the earth, only a small fraction can be stored for future use. The plant world is amazingly efficient in transforming heat and light from the sun into forms of potential chemical energy which the animal world, in turn, spends in the form of heat and work. Carbohydrate is the chief form of stored energy in plants; fat is the chief form in animals. The story of energy metabolism is concerned with the transforming and the spending of energy by the human body.

Metabolism is a term used to designate the chemical changes that take place in the body through the action of its cells. Metabolism includes many activities; among them are the changes in the foodstuffs after absorption from the alimentary tract. These changes, which result ultimately in the combustion of foodstuffs, with the release of heat or energy, constitute what is called energy metabolism.

ENERGY AND HEAT

Energy is expended whenever work is performed by the body in the completion of any act, small or large. It matters not whether the action is voluntary, such as walking, sitting, and the various acts involved in the performance of one's daily work, or involuntary, such as in the circulation of the blood, respiration, digestion, and the maintenance of muscular tension or tone.

As the furnace must be fed frequently with fuel in order to meet the expenditure of energy in the form of heat given out, so must the body be supplied with food as a source of energy for warmth and work. There is a direct relation between the amount of work performed, the heat produced by the body and the total food intake. One cannot perform more work than is provided for by the food intake unless one "borrows" from the reserve supply stored as adipose tissue or as glycogen in the liver or the muscles. This "borrowing" habit is a bad one. The average daily intake should equal, or slightly exceed, the daily energy requirement, except in cases of obesity, when it should be slightly lower.

Heat in Relation to Metabolism. Heat is an accompaniment of combustion and likewise of energy pro-

duction; therefore, it can serve as a measure of energy metabolism. The calorie has long been used as the measure of heat. As it is necessary to have measures of length (centimeter, inch), measures of weight (gram, ounce), and measures of volume (quart, liter), so it is necessary in scientific work to have a measure of heat. A calorie is the amount of heat required to raise the temperature of one kilogram of water one degree centigrade. In our more common measures, it is approximately the amount of heat required to raise the temperature of four pounds of water one degree Fahrenheit.

MEASURING FOOD CALORIES

A bomb calorimeter is a device for measuring calories, the stored fuel in foods, just as it is for measuring the fuel value of wood, coal or oil. The apparatus shown in Figure 11 is carefully designed for measuring all the heat produced by the complete oxidation of an accurately measured amount of any food. The apparatus is insulated thoroughly against loss of heat, and the amount of heat produced is measured by the change in temperature of a measured amount of water.

Physiologic Fuel Values. The calorie value of nutrients determined by the bomb calorimeter must be modified to take account of losses in digestion and excretion. From a large number of determinations, Atwater derived the well-known physiologic fuel values:

Protein	4 calories per Gm.
Fat	9 calories per Gm.
Carbohydrate	4 calories per Gm.

These values were approximate only, but they served reasonably well when applied to foods in the average American diet. This method of calculating the fuel value of individual foods had been used since 1900, although the inaccuracies were recognized. In the Agriculture Handbook No. 8 published by the U. S.

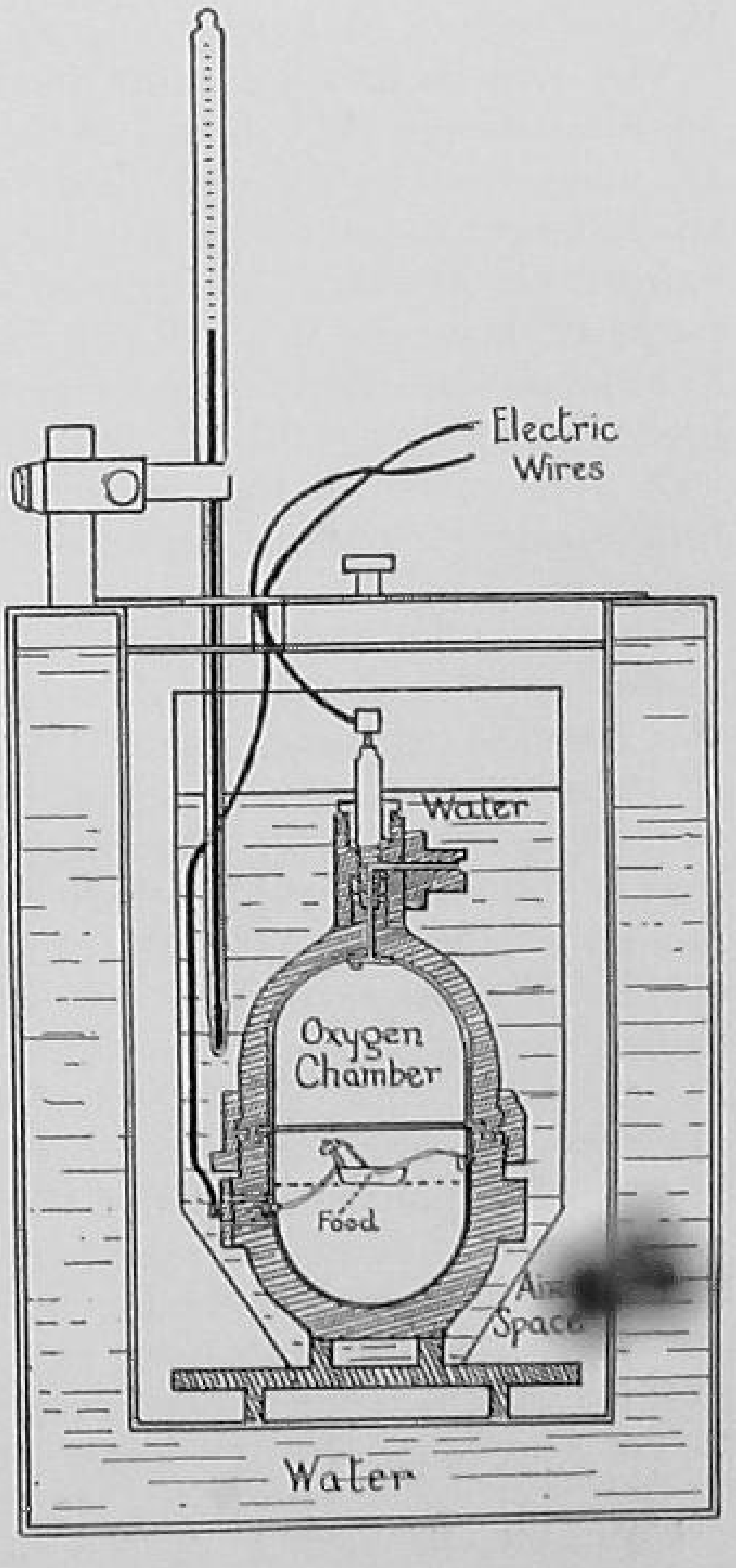


Fig. 11. Diagram of the parts of a bomb calorimeter. The water in the inner chamber changes in temperature when the food is burned. The water in the outer chamber acts with the intervening air space as insulation. (Jean Broadhurst)

Dept. of Agriculture in 1950,[1] calorie values are calculated by a modification of the procedure that had been in use for 50 years. Instead of applying the general caloric factors 4,9,4 to the percentage composition of food, as had been done previously, more specific factors were used. These new factors take into consideration further research data on the fuel values of foods.

The new values for most foods approximate the old values, but they are more accurate for such foods as whole wheat, where there is a large indigestible fraction. For practical purposes, however, it is still possible to estimate the caloric value of most foods by applying the old physiologic fuel values to the percentage composition for protein, fat and carbohydrate.

The need for revising the U. S. method of calculating food values was emphasized during World War II, when international committees were concerned with the world's food supply. They could not talk the same nutrition language unless they could agree upon methods of estimating the nutritional value of foods. As a result, the FAO Nutrition Division published its findings in 1947.[2] The policies and the data given in that publication became the basis of the present method of calculation. Table 1, in Part Four, Composition of Foods, has been revised to conform with Handbook No. 8.

[1] Watt, B. K., and A. L. Merrill: Composition of Foods: Raw, Processed, Prepared. U.S.D.A., Agr. Handbook No. 8, 1950.

[2] FAO: Energy-Yielding Components of Food and Computation of Calorie Values. Washington. FAO. 1947.

MEASURE OF ENERGY EXPENDED

The actual energy expended by the body throughout a given period may be determined by placing a human subject in a special calorimeter, as food is enclosed in the bomb calorimeter. The heat given off by the subject is absorbed by the water in the coils surrounding the well-insulated chamber, where, by an accurate mechanism, the total heat may be measured. This procedure is known as direct calorimetry.

As there are in existence only a few calorimeters large enough for making direct observations on human beings, and since they are exceedingly expensive, this method is used chiefly for scientific research. By another method, known as indirect calorimetry, the rate of metabolism is calculated from the oxygen intake measured by a respiration apparatus. From the oxygen consumed in a given number of minutes the caloric expenditure can be calculated, because the average caloric equivalent of a liter of oxygen for a person on a mixed diet has been determined to be 4.825 calories. The calculation is simplified by the use of accurately ruled paper made to fit a standard recording drum with speed of rotation carefully regulated.

The subject lies on a cot and breathes through a nosepiece or a mouthpiece, the subject himself forming a "closed circuit" and using only oxygen from a measured supply. This type of apparatus is now installed in most of the larger hospitals of the country. This metabolism test is used extensively as a means of diagnosis, particularly in cases of hyperthyroidism, hypothy-

roidism, myxedema and other endocrine disturbances which may alter the metabolic rate.

BASAL METABOLISM

In order that there may be some basis of comparison for such tests, the rate of metabolism must be studied under standard conditions. Therefore, it is specified that the subject be awake but at complete rest, and that the test be taken at least 12 hours after the last meal and several hours after any vigorous exercise. The rate of metabolism as determined under these "standard" conditions is known as the basal rate and is often spoken of as the basal metabolism. Marked variations in the basal rate of metabolism are an indication of disease.

VARIATIONS IN BASAL METABOLIC RATES

There are normal variations in basal metabolism, the causes of which lie within the body itself: the size, the shape and the composition of the body; the age of the individual and the activity of certain internal glands. It is generally accepted that a variation of from 10 to 15 per cent either way from the accepted metabolism rate (all variables considered) is within normal limits.

The surface area of the body is used as a measure of size in these studies. The skin of the body is a

FIG. 12. A respiration apparatus for making basal metabolism measurements. (McKesson Appliance Co.)

radiating surface from which heat is given off continually. Therefore, the greater the skin area, the greater will be the amount of heat lost by the body and, in turn, the greater the necessary heat production by the individual. It has been found that a tall, slender person has a greater surface area than a shorter, stout person of the same weight; that is, surface area is proportional to height multiplied by weight. The basal metabolism of an average man and woman would be about 1,700 or 1,400 calories, respectively. A large proportion of adipose tissue lowers the metabolic rate, as the muscular tissues are the chief seat of energy metabolism. Complete tables of average metabolic rates for men and women of different age, height and weight are used for comparison with the measured rate.

Age and growth are responsible for normal variations in basal metabolism. The relative rate is highest during the first and the second years and decreases after that, although it is still relatively high through the ages of puberty, both in girls and in boys. During adult life there is a steady decrease in rate with a marked drop in old age, due undoubtedly to lower muscle tone resulting from diminishing muscular activity.

Sex probably has little effect upon metabolism, although women in general have a lower metabolism than men; but this may be because women are usually smaller and less active. However, Benedict[3] found that women of the same height and weight as men had a metabolic rate that was about 5 per cent lower than that of men. He accounts for this by a difference in body composition, women usually having a little more fat and less muscular development than men. However, there are certain increases in metabolism that are incident to the female sex.

The internal secretions of certain glands of the body, such as the thyroid and the adrenals, materially affect metabolism. The secretion of the thyroid gland has the most marked effect. Hyperthyroidism is that condition in which the metabolism is accelerated by increased production of thyroid extract, while hypothyroidism is characterized by a decrease from the normal amount resulting in subnormal metabolism. Other glandular secretions may affect metabolism to a lesser degree, but their significance in this respect is not well understood.

WORK AND FUEL REQUIREMENTS

Body work is of two kinds, voluntary and involuntary. During waking hours there is an almost constant movement of some part of the body, bringing into play the voluntary muscles, but by far the greater proportion of body work is carried on by the unceasing activity of the involuntary muscles. The work of the circulatory and the respiratory systems never stops so long as life persists; the digestive processes go forward without conscious attention. The muscles are always in a slightly contracted state. For all these forms of involuntary work, energy or fuel is required. For all voluntary activities the fuel needed is in direct rela-

[3] Benedict, F. G., and L. E. Emmes: J. Biol. Chem. **20**:253, 1915.

Energy Expenditure per Hour Under Different Conditions of Muscular Activity[4]

Form of Activity	Calories per Hour: Per 70 Kilograms (average man)	Per Kilogram	Per Pound
Sleeping	65	0.93	0.43
Awake lying still	77	1.10	0.50
Sitting at rest	100	1.43	0.65
Reading aloud	105	1.50	0.69
Standing relaxed	105	1.50	0.69
Hand sewing	111	1.59	0.72
Standing at attention	115	1.63	0.74
Knitting (23 stitches per minute on sweater)	116	1.66	0.75
Dressing and undressing	118	1.69	0.77
Singing	122	1.74	0.79
Tailoring	135	1.93	0.88
Typewriting rapidly	140	2.00	0.91
Ironing (with 5-pound iron)	144	2.06	0.93
Dishwashing (plates, bowls, cups and saucers)	144	2.06	0.93
Sweeping bare floor (38 strokes a minute)	169	2.41	1.09
Bookbinding	170	2.43	1.10
"Light exercise"	170	2.43	1.10
Shoemaking	180	2.57	1.17
Walking slowly (2.6 miles per hour)	200	2.86	1.30
Carpentry, metal working, industrial painting	240	3.43	1.56
"Active exercise"	290	4.14	1.88
Walking moderately fast (3.75 miles per hour)	300	4.28	1.95
Walking downstairs	364	5.20	2.36
Stoneworking	400	5.71	2.60
"Severe exercise"	450	6.43	2.92
Sawing wood	480	6.86	3.12
Swimming	500	7.14	[illegible]
Running (5.3 miles per hour)	570	8.14	[illegible].70
"Very severe exercise"	600	8.57	3.90
Walking very fast (5.3 miles per hour)	650	9.28	4.22
Walking upstairs	1,100	15.80	7.18

[4] Sherman, H. C.: Chemistry of Food and Nutrition, New York, Macmillan.

tion to the intensity of the exercise. For instance, a moderate amount of energy is needed for walking, while for the heavy labor of digging a ditch or for the active exercise of tennis a considerable amount of fuel is needed.

Muscular work is the greatest fac-

tor influencing energy requirements. Mental work, strange as it may seem, does not affect the total metabolism sufficiently to be detected by the calorimeter. Investigators, working with a very delicate apparatus, found that nerve tissue did expend some energy, but that the amount expended by this tissue was very small indeed compared with the total energy of the body. In exceptional cases, physical work may be the means of increasing the metabolism by as much as 4,000 calories per day. In every case the food intake should equal in caloric value the heat units expended by the body (except, of course, in overweight individuals who find it necessary to reduce). A man doing sedentary work may require only 2,500 calories per day, while a man doing exceedingly hard manual labor may require as much as from 5,000 to 6,000 calories. The data on page 51 from various metabolism studies have been arranged for reference on the basis of a man of average size—70 Kg., or 154 pounds. Data are also given per unit of weight that can be applied for men or women. The calories for each activity listed include basal plus the extra calories spent for work. One may easily calculate the approximate calories required for these vocations and for others that would require similar exertion.

A nurse weighing 130 pounds and on active duty 8 hours a day might estimate her total energy expenditure for the 24 hours from the accompanying list of activities. The results of such a calculation are given below as a sample. An office girl with less activity would expend considerably fewer calories, but a man weighing more and in sedentary occupation may expend about the

Calculation of Energy Expended for a Nurse's Activities for One Day	Time in Hours	Calories per Pound	
		Per Hour	Total
Sleeping	8	.43	3.44
Lying still, reading	1	.50	.50
Dressing and undressing	1	.77	.77
Sitting, eating meals, knitting, etc.	5	.75	3.75
On duty, 8 hours			
Care of patients, lifting, walking, etc.	6	.93	5.58
Sitting, reading, writing	2	.69	1.38
Walking to and from work	1	1.30	1.30
	24		
	Total per pound..		16.72
Multiplied by body weight, 132 pounds			132
Total energy expenditure for the day			2,207

same calories as the more active woman.

A quick estimate of the energy needs of a moderately active person may be made by allowing 25 calories per kilogram of body weight for basal needs plus 50 per cent of the basal figure for activity. The increase is proportional to the degree of activity, as indicated in the following table. The average nurse would probably find herself in Group (d) below:

Approximate Daily Energy Needs of an Adult Based on Weight and Activity

(a)	Basal metabolism	25 cal./Kg.
	Increase above basal	per cent
(b)	Bed rest (hospital ward)	10
(c)	Very light activity (knitting)	30
(d)	Light activity (tailor, nursing)	50
(e)	Moderate activity (carpenter)	75
(f)	Severe activity (stone mason)	100

A person who habitually consumes more calories than he expends for work plus body heat tends to store the extra food as body fat (adipose tissue). This is easy to do, especially when one's activities are less than they were previously. Frequently, eating habits are not adjusted to fit reduced activities. Therefore, it is not surprising that people tend to gain weight with age; it is more surprising that they do not gain more weight. A fuller discussion of weight control and the treatment of obesity is given in Chapter 18.

Habitual muscular exercise not only increases the total energy metabolism but affects the basal rate because energy is required to maintain muscle tone. On the other hand, sleep lowers metabolism because the muscles are relaxed. A prolonged period of absolute rest in bed means loss of muscle tone and lowered metabolism.

OTHER FACTORS AFFECTING TOTAL METABOLIC RATE

The intake of food also increases metabolism. This is most marked after the food products reach the blood stream, the effect being noticed in from one half to five or six hours, depending upon the type and the amount of food consumed. One research worker found that a fasting man had a metabolism averaging 9 per cent lower than what he had on the days when food was consumed. Another worker found a difference of about 22 per cent between the fasting days and the days when a liberal diet was taken. However, metabolism goes on during fasting, showing that the body must continue burning fuel supplies even though the tissues are called upon to make up the deficit. This explains the loss of weight and wasting in severe illness and starvation.

With prolonged fasting and subsequent loss of weight, the body tends to adjust itself by a lowering of the metabolic rate. This is comparable with setting back a thermostat so that the organism runs at a lower rate. This adjustment is true of adults, but children who are undernourished seem to have a higher rate, which makes undernutrition in children even more serious than in adults. So far there is no satisfactory explanation for this difference.

Specific Dynamic Action of Protein. Not all kinds of food are oxidized with an equal effect upon metabolism. Protein stimulates metabolism, so that a greater amount of heat is produced in its metabolism than in that of similar quantities of fats and carbohydrates. This stimulation is undoubtedly due to certain intermediate products resulting from the splitting of protein in the oxidation processes in the tissues and is commonly known as the specific dynamic action of protein. Carbohydrates and fats have a much less marked effect, but the slight stimulation that results from the intake of food of any type accounts for the fact that metabolism tests usually are taken before breakfast when no food has been eaten for at least 12 hours. For a person on an average diet the specific dynamic action of food may account for about 10 per cent rise above the basal.

Climate, season, housing and clothing affect metabolism, chiefly through their bearing upon the regulation of body temperature. The heat produced in the body by metabolic processes must be conserved or given off in such a way as to maintain the body temperature at a remarkably constant figure. If no heat were lost from the body during average daily activity, the temperature would rise about 2° an hour. In winter we purposely curtail our heat loss from the body by wearing heavier clothing and living in heated houses, while in summer we wear thinner clothing to expedite greater losses. However, nature has provided for a carefully controlled loss of heat that may vary as climate and environment dictate. A thinly clothed person on a cold winter day may shiver. This process is a series of rapid muscular contractions set up involuntarily in the body to increase heat production in order to make up for the rapid heat loss. Evaporation of perspiration from the skin is a mechanism employed by the body to reduce temperature. Insensible perspiration is evaporating continuously with a slight loss of heat, but sensible perspiration means greater heat loss and affords a welcome cooling effect when the body is overheated in warm weather or after strenuous exercise.

Although a number of essential nutrients should be considered in the selection of an adequate diet (see succeeding chapters), it must not be forgotten that the caloric value is fundamentally one of the most important, as DuBois[5] pointed out when he stated:

"Calories in medical practice are just as important as they ever were, in spite of the fact that attention has been centered on vitamins. No supplements of vitamins or mineral elements can alter the laws of the conservation of energy. Calories are still needed to keep the body warm and to furnish energy for muscular work."

When emergencies arise in war or famine it is total calories which must be provided first to keep people alive and satisfied. The quality and the nature of the calories can be adjusted later to meet specific needs.

[5] DuBois, E. F., and Chambers, W. H.: J.A.M.A. 119:1183, 1942.

STUDY QUESTIONS

1. Explain the use of the word *metabolism* in the two expressions—"energy metabolism" and "protein metabolism."

2. What is the unit of measure for energy and how is food energy measured?

3. What are the so-called physiologic fuel values? How can they be used to estimate food values?

4. Milk has the percentage composition of 3.5 Gm. protein, 4 Gm. fat and 5 Gm. carbohydrate per 100 Gm. Calculate the caloric value of a glass of milk weighing 240 Gm.

5. What change in the calculation of caloric value of foods was recommended in 1950 and why was it necessary?

6. What is measured in a basal metabolism test? Under what conditions must the test be performed? Name the factors which affect the basal metabolic needs of any given individual.

7. What is the largest single factor affecting the total energy requirement? List other factors which play a part in the total calories needed.

8. Calculate the energy requirement of a moderately active 60 Kg. (132 lbs.) nurse by the quick method of allowing 25 calories per Kg. of body weight for basal needs plus 50 per cent for activity. Now use the table on page 51 and calculate her energy needs more carefully. Compare the figures. Is the quick method reasonably accurate?

9. Determine from your study of the previous chapters which foods will contribute largely calories to the diet. Check your answer with the food composition tables in the back of the book.

10. The basal metabolism of a man of average size is about 1,700 calories per day; of a woman of average size, about 1,400 calories. If the measured basal metabolism for such a person was 12 per cent below average (−12), how many calories per day would each be expending under basal conditions?

11. When there are acute food shortages, should relief agencies supplying a minimum of food to relieve starvation think first of calories, protein or vitamins, and why?

CHAPTER SIX

Minerals

MINERALS ESSENTIAL FOR LIFE
MINERAL COMPOSITION OF THE BODY
CALCIUM AND PHOSPHORUS
IRON
IODINE
TRACE ELEMENTS
SODIUM, POTASSIUM, MAGNESIUM, SULFUR AND CHLORINE
ACID-BASE BALANCE
ACID-BASE REACTION OF FOODS

MINERALS ESSENTIAL FOR LIFE

Minerals have been classed among the "little things" in nutrition but they are far from little in importance. Plant life, animals, bacteria and other one-celled organisms all require proper concentrations of certain minerals to make life possible. Minerals serve as part of structural tissue or in control of certain functions. Changes of concentration which may seem small can be fatal. Thus common salt, which in dilute solution is necessary for most forms of animal life, becomes a preservative when foods are salted or kept in brine because the concentration kills bacteria. On the other hand, marine forms (fish and shell fish) quickly die when subjected to fresh water.

In natural foods, minerals are present in various forms mixed with or combined with proteins, fats and carbohydrates. Processed or refined foods, such as fats, oils, sugar and cornstarch, contain almost no minerals. The total mineral content of a food is determined by burning the organic or combustible part of a known amount of a food and weighing the resulting ash. The ash is then analyzed for individual mineral elements. Most foods have been analyzed for ten or more mineral elements, but in dietary practice the figures most commonly used are those for calcium, phosphorus and iron.

Minerals such as iodine, fluorine and other trace elements which are essential for life may be found abundantly in drinking water in certain areas or in foods grown on soils in those areas, while in other parts of the country they are deficient in both soil and water. Still other mineral elements such as sodium, potassium, chlorine, sulfur and magnesium, all necessary in human nutrition, are so universally present in foods that we do not need to worry about deficiencies. It is worth while to know how they function, however, and they will be discussed briefly.

Accurate data on the mineral constituents of common foods no longer satisfy the scientific nutritionist. The

question of relative availability of mineral elements in various forms for physiologic processes has stimulated new investigations in this field. In discussions of the subject written 40 or more years ago the opinion prevailed that the organic forms of minerals found in plant and animal foods were better utilized than the inorganic. However, modern research has disproved this theory. Today we are aware that many minerals occur in inorganic form in natural foods and, as such, are absorbed from the digestive tract without change. After absorption into the blood and the tissues, minerals may function as simple salts or be incorporated into organic complexes. Sulfur and small amounts of other elements are incorporated in organic compounds which need digestion before they can be absorbed. In certain foods, calcium or iron may be unavailable because they are combined in insoluble and indigestible forms. Thus, calcium in spinach, chard and beet greens is combined with oxalic acid to form insoluble oxalates which are not absorbed.

The food tables (Table 1, Part Four) giving mineral content of foods do not tell us how much of these minerals is available to the body. Until such information is obtained and recorded, we must accept and use tables of the total mineral in foods with recognition of this discrepancy.

MINERAL COMPOSITION OF THE BODY

The organic constituents, carbohydrate, fat, protein and related substances, plus water make up about 96 per cent by weight of the human body. The remaining 4 per cent or less (6 lb. of an average man's weight) is mostly mineral in some form, some as hard tissues such as bones and teeth, some as salts in the fluid of the body. The most important structural or functioning mineral elements in the human body are listed in the accompanying table.

MINERAL COMPOSITION OF AN ADULT HUMAN BODY[1]

Element	Per Cent of Total Ash	Gm./70 Kilo Man
Calcium (Ca)*	39	1,160
Phosphorus (P)*	22	670
Potassium (K)	5	150
Sulfur (S)	4	112
Chlorine (Cl)	3	85
Sodium (Na)	2	63
Magnesium (Mg)	0.7	21
Iron (Fe)	.15	4.5
Iodine (I)	.0007	.02
Manganese (Mn), Copper (Cu), Cobalt (Co), Nickel (Ni), Fluorine (Fl), Zinc (Zn), Aluminum (Al), Arsenic (As), Bromine (Br), Silicon (Si) and Selenium (Se)	Traces	

[1] Shohl, A. T.: Mineral Metabolism, New York, Reinhold, 1939.

* Amounts of calcium and phosphorus are variable according to the bone composition and the reserves of these elements in bone.

CALCIUM AND PHOSPHORUS

Calcium is the mineral most likely to be deficient in the average American diet. Phosphorus also is found to be low in some cases.

Although calcium and phosphorus usually are associated because they

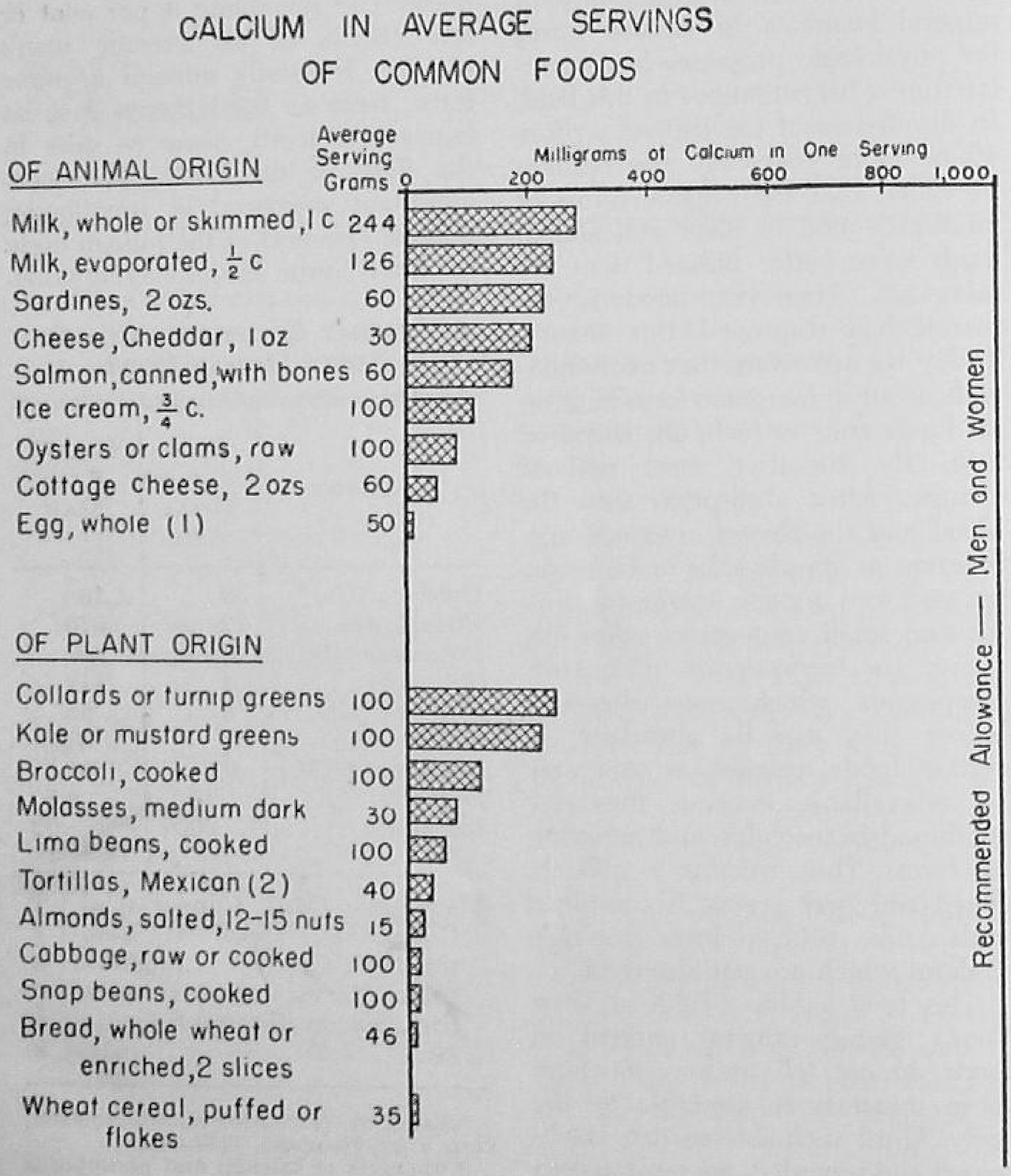


FIGURE 13

function together in the body, they are not always found in the same foods.

Food Sources of Calcium and Phosphorus. Milk and milk products are the most important sources of readily available calcium. Most green, leafy vegetables contain calcium salts, varying according to type and soil where grown. However, there is a wide range in the availability of the calcium from green leaves, depending upon the amount of oxalic acid present. With it the cal-

cium forms insoluble salts. In most sections of the country greens are not used regularly enough or in sufficient quantity to be relied upon to replace milk, but they are important when milk is scarce or unobtainable. From Figure 13 it is apparent that relatively few foods are rich sources of calcium. It is possible to meet the calcium requirement, even on a low caloric intake, if foods are well chosen. The calcium contribution of a basic dietary pattern providing about 1,500 calories is shown on page 64.

Phosphorus is more widely distributed and less likely to be deficient in the average diet than calcium. Poultry, fish, meats, cereals, nuts and legumes, as well as milk and milk products, are all good sources.

There may be slight losses of calcium and phosphorus in the cooking of vegetables, especially if the cooking water is discarded. There are wide differences in mineral content of plants grown on different soils. Thus foods should be chosen with a view to supplying an excess of these elements and providing a liberal margin of safety. This excess should be as great as in the case of protein, if not greater, because of larger losses in cooking and in digestion. For the child, from ¾ to 1 quart of milk a day, together with other foods suitable for his age, provides such a margin of safety.

Function. Ninety-nine per cent of the calcium in our bodies and a large percentage of the phosphorus are found as normal constituents of bone, giving to it strength and rigidity. When calcium phosphate is removed from bone, the remaining tissue is as flexible as cartilage; in fact, it is essentially the same as cartilage. Cartilage precedes bone in the development of the fetus and the young animal, and normally the calcium phosphate is deposited in it as growth and strain demand. When nature's plan is thwarted by an inadequate supply of either of these minerals in food, or by an inability to utilize them, growth may be retarded; or, as more often happens, growth in size continues, but the normal development of the bone is interfered with, resulting in the bowed legs, enlarged ankles and wrists, prolapsed thorax and other bone deformities characteristic of rickets.

Calcium and phosphorus perform other less conspicuous but necessary functions in the body, of which only a few can be mentioned here. Calcium in the blood is necessary for the process of clotting. Blood calcium below normal gives rise to tetany, and the physician may prescribe calcium to be given intravenously in order to raise the blood level of calcium and stop the muscle twitching characteristic of tetany.

Phosphorus is a necessary constituent of every cell in the body and is especially important in nerve tissue. Radioactive phosphorus used as a "tagged" element in metabolic research has confirmed the wide diversity of function of phosphorus.

Phosphates are now recognized as playing a major role in muscle physiology. A complex carbohydrate-phosphate compound is the storage battery which can release muscular energy immediately when a nerve impulse gives the order.

Phosphates also assist in main-

taining the acid-base balance of the blood. Further consideration will be given to this function in the discussion of the acid-base equilibrium in the body.

Dietary Requirements. The dietary requirements of calcium and phosphorus for children and adults have been investigated extensively. Earlier work with animals led the way on how to attack the problems in hu-mans.

The assumption that end-produc of metabolism appear in the urin and unabsorbed material in the fece does not hold for calcium and pho-phorus. Some metabolized calciu and phosphorus may be excreted v the intestinal tract. Thus the prob-lem of balance studies to determin

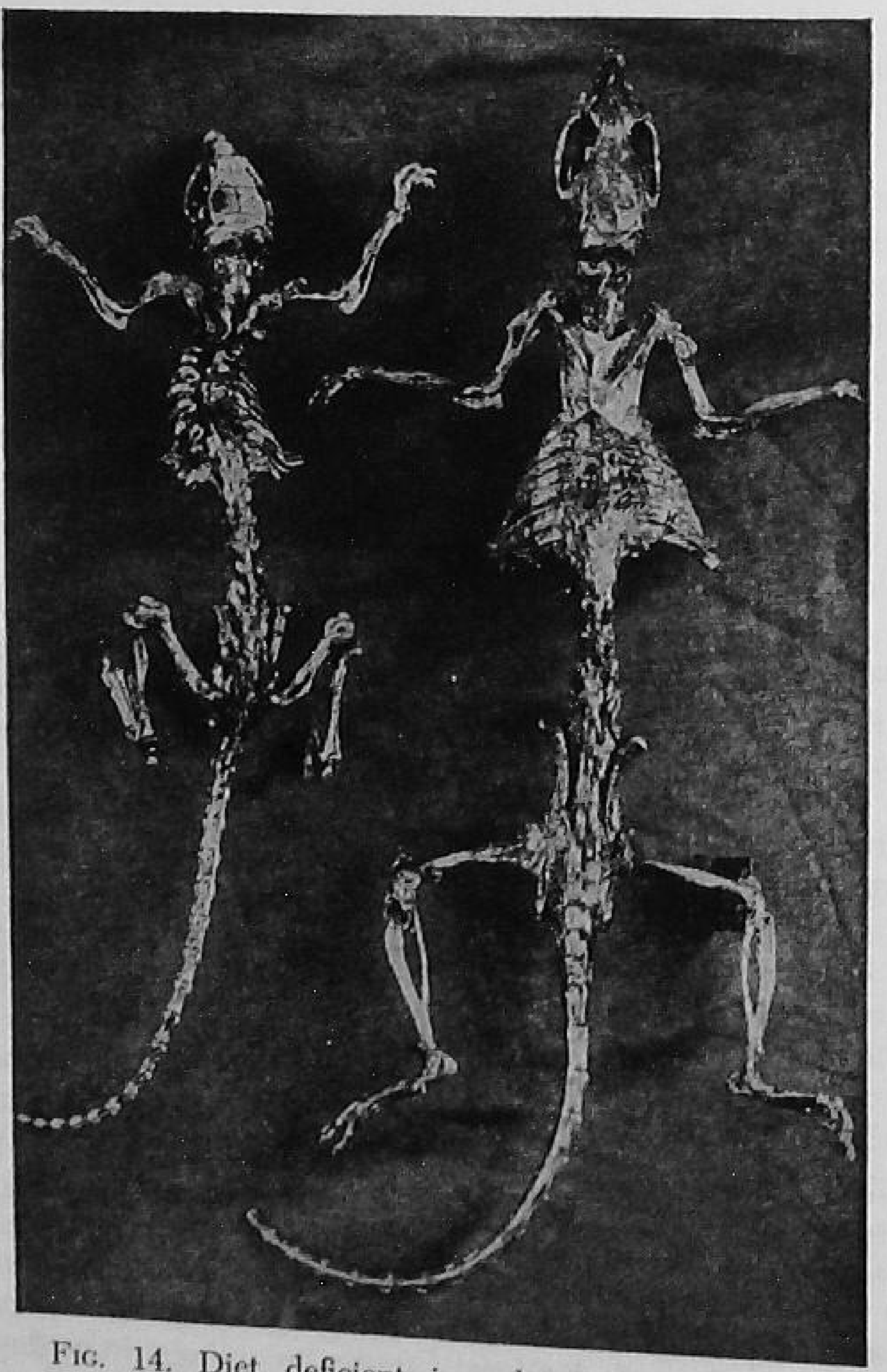


FIG. 14. Diet deficient in calcium compared with normal diet (in rats). Note spinal curvature, deformed ribs and stunting.

calcium and phosphorus requirements are complicated. A person is said to be in equilibrium with respect to any nutrient if the intake approximately equals the output.

The maintenance requirement of calcium for adults was determined by finding the smallest amounts taken in food which would maintain an equilibrium. This minimum figure, which did not take into account any stresses, strains or emergency needs, was then increased by 50 per cent to give an average requirement figure. At first it was thought that 0.8 Gm. per day for an adult would provide an adequate margin of safety. More recent studies and re-examination of all evidence available up to 1948 were the basis for the revised Food and Nutrition Board figure of 1.0 Gm. of calcium per day for adults (Chap. 9). The same allowance is recommended for women as for men, despite their smaller average size, in order to ensure ample stores in preparation for maternity.

In the Recommended Allowance Table no figures are given for phosphorus because dietary deficiencies of phosphorus are uncommon when diets are adequate in calcium and protein. In general, the phosphorus allowance should be at least equal to the calcium for children and for women during the latter part of pregnancy and during lactation. For all other adults the phosphorus allowance should be approximately 1.5 Gm. per day.

The calcium and phosphorus requirements for growth have been investigated on children of different ages, observing the level of intake at which maximum retention of calcium and phosphorus is attained. Growth of bone requires the storage of new calcium and phosphorus as well as replacement. The growth requirement varies with age, being highest in relation to weight in the infant, lower and fairly constant after the first year and until puberty, when there is a sharp rise again during the period of rapid growth. The recommended allowances of calcium for children take into account the different ages and sex needs. For no nutritional factor other than calcium is the total allowance per day as great for children as it is for adults.

A careful selection of foodstuffs rich in calcium and phosphorus is necessary to meet these needs. For infants, the intake requirements may well be stated in terms of the amount of milk, since this is the chief food resource. For older children, the requirements for calcium and phosphorus are most easily met by including a quart of milk a day or its equivalent in milk products. The calcium and the phosphorus content of milk is not only high but in good proportion, and these factors are more readily available from milk than from most other foods. During all periods of growth vitamin D, or sunshine, is essential for the most efficient absorption and utilization of these two minerals, but vitamin D can function only when calcium and phosphorus are present in reasonably adequate amounts. Compare the story of vitamin D in Chapter 7.

IRON

Iron is another mineral that is apt to be low in certain types of American diets, although comparatively

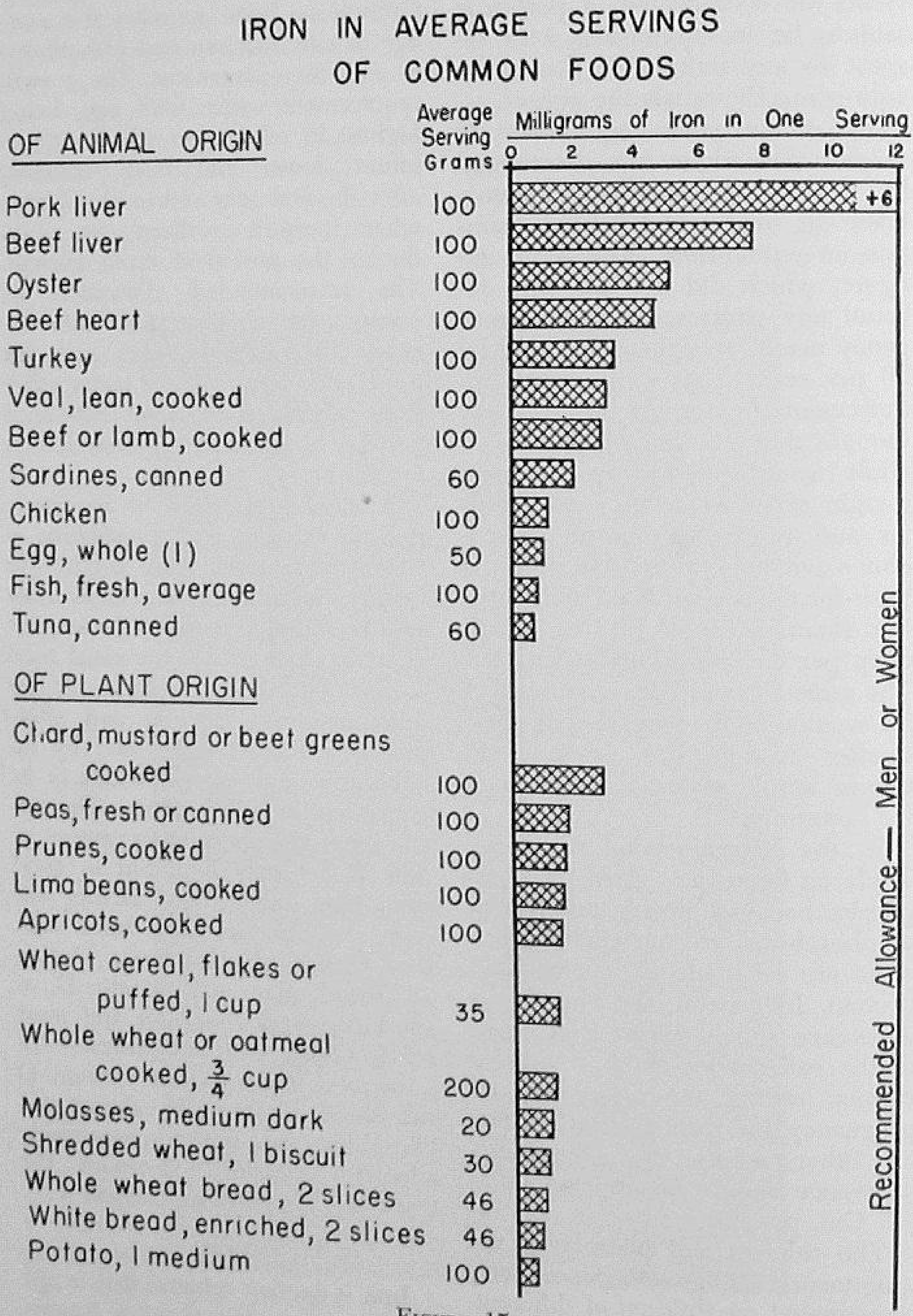

IRON IN AVERAGE SERVINGS
OF COMMON FOODS
OF ANIMAL ORIGIN
Average Serving Grams
Milligrams of Iron in One Serving
0 2 4 6 8 10 12
Pork liver 100
+6
Beef liver 100
Oyster 100
Beef heart 100
Turkey 100
Veal, lean, cooked 100
Beef or lamb, cooked 100
Sardines, canned 60
Chicken 100
Egg, whole (1) 50
Fish, fresh, average 100
Tuna, canned 60
OF PLANT ORIGIN
Chard, mustard or beet greens cooked 100
Peas, fresh or canned 100
Prunes, cooked 100
Lima beans, cooked 100
Apricots, cooked 100
Wheat cereal, flakes or puffed, 1 cup 35
Whole wheat or oatmeal cooked, 3/4 cup 200
Molasses, medium dark 20
Shredded wheat, 1 biscuit 30
Whole wheat bread, 2 slices 46
White bread, enriched, 2 slices 46
Potato, 1 medium 100
Recommended Allowance — Men or Women

FIGURE 15

small amounts are needed. There are less than 5 Gm. of iron in the body of a full-grown healthy person, but its importance to our well-being is strikingly out of proportion to the quantitative figures.

Blood Building. Iron is a necessary constituent of hemoglobin, the coloring matter of the red blood cells, and is an essential constituent of every cell in the body. As a constituent of hemoglobin it is vitally essential to the processes of nutrition. Hemoglobin is a compound of protein, iron and a pigment complex. Hemoglobin combines with oxygen in the lung capillaries to form oxyhemoglobin and as such travels in the blood stream to the tissues, where the oxygen is released to take part in oxidative processes. Part of the carbon dioxide formed is carried back by the same hemoglobin, which drops its load in the lungs and starts out with a new load of oxygen. Therefore, it is highly important that the food contain sufficient amounts of iron along with other necessary elements needed for its utilization. The iron of our bodies is used very efficiently. It probably is not used up or destroyed when it becomes a constituent of hemoglobin but is conserved and can be utilized again and again. Resynthesis of hemoglobin is presumed to take place in liver or bone marrow. Small amounts of unabsorbed iron may be lost in the stools; very little is excreted in the urine. Loss of blood due to hemorrhage, menstruation or accident is responsible for the major loss of iron from the body.

Boys and men require less food iron than do girls or women during the age when the latter must replenish blood lost monthly. A shortage of iron may cause anemia if the deficiency occurs when there is increased need for iron, such as in growth, pregnancy or blood loss. This increased demand may be normal, as in the first two instances, or it may be abnormal, due to hemorrhage. (See Anemias, Chap. 29.)

Food Sources. The richest sources of iron from animal and plant products are given in the accompanying chart. On the basis of average servings, liver, other organs, meats and oysters are the richest animal sources; and green, leafy vegetables top the list of plant sources. Such foods as molasses, nuts and raisins, popularly featured as food sources of iron, are rich on a percentage basis, but small servings of these foods used infrequently do not constitute as important a source of food iron as some staple foods, such as whole grain or enriched breads and cereals. The iron content of all common foods is given in Table 1, Part Four. It will be observed that foods poor in iron have a noticeable lack of pigment, which is significant, since iron salts are all colored and usually lend color to a food rich in this element. Compare, for instance, egg yolk with egg white, molasses with white sugar, whole with milled grains, and spinach with celery. With a few exceptions, such as the potato and enriched white bread, it may be helpful to remember that white foods are not good builders of red blood.

The basic dietary pattern for one person, as outlined in Chapter 1, provides an ample amount of both calcium and iron, well above recommended allowances.

It has been shown that there is a marked difference in the availability of iron derived from various food sources. For instance, only about half the iron in whole cereals is in usable form, and even less in certain green leaves. It is impossible to tabulate available iron in foods at present, but work in progress may throw further light on the subject.

Factors Influencing Hemoglobin Synthesis. Since early in this century research workers have been investigating the factors which influence iron utilization and hemoglobin synthesis. Concepts of iron absorption and utilization have undergone revolution more than once. A student interested in the history of research in this field will find some dramatic incidents. From the maze of findings certain well-established facts have evolved.

The iron in foods may be in either organic or inorganic compounds, and its availability for human nutrition depends upon other factors than the form in which it occurs. Iron absorption may be hindered by certain abnormal conditions in the alimentary canal, especially a lack of sufficient hydrochloric acid in the stomach. By the use of radioactive iron which can be followed as a tracer, it appears that iron is absorbed from the intestinal tract largely in response to need, and the rest is discarded.

Following absorption, iron is transported to the liver for storage and can be utilized for hemoglobin synthesis only if traces of copper are present. The discovery of the catalytic action of copper in the use of iron for elaboration of hemoglobin was dramatic because it was the first proof of one inorganic element's functioning in the utilization of another. Copper is not present in the hemoglobin molecule. Adequate protein must also be available for syn-

Calcium and Iron in Basic Diet

Food for One Day	*Measure*	*Calcium mg.*	*Iron mg.*
Milk or equivalent	1 pint	576	.4
Vegetables:			
Potato	1 small	13	.7
Green, leafy, yellow	½–⅔ cup	110	1.2
Other	1–1½ cups	50	2.2
Fruits:			
Citrus	½ cup	23	.3
Other	1 cup	25	1.3
Egg	1	26	1.3
Lean meat or alternates	3½ oz. cooked	10	3.0
Bread, whole grain or enriched	3 sl.	60	1.4
Cereal, whole grain or enriched	½–⅔ cup	10	.9
Butter or margarine	1 tbsp.	3	...
		906	12.7

thesis of the complex compound, hemoglobin. Other dietary essentials, especially certain vitamins, seem to aid in this process, according to Leverton,[2] who demonstrated that young women could maintain their hemoglobin level on less iron if all other essentials were present in the diet. Apparently iron is a mineral element which is rigidly conserved by the body and used repeatedly. If no blood is lost there is little need for new iron except for the growth of a new organism.

Dietary Requirements. Adults. The recommended allowances of the Food and Nutrition Board list 12 mg. of iron per day for normal adults, with 15 mg. per day during pregnancy and lactation. These figures represent the consensus of experienced nutritionists based upon research work done in many laboratories.

The 12 mg. may be more liberal than is necessary for men, because there is evidence that the male adult needs relatively little iron. Usually, this need is met if the diet is adequate in other respects. This figure has been retained, however, until more data on the subject are available, because this level can be attained without difficulty, and a generous intake may be desirable for other reasons.

Children. During the period of rapid growth when an increase in red cells and hemoglobin is taking place, provision for new material as well as replacement requires a more liberal supply of iron. The anemias of infancy and childhood are evidence of the shortage that frequently occurs, although nature seems to have made provision for the period of nursing. Milk is essentially low in iron, but a reserve of this mineral stored in the liver of the infant during prenatal life is drawn upon during the nursing period and economically conserved for repeated utilization. The potential shortage of iron that might occur by the sixth or the seventh month may be forestalled by the early use of egg yolks, vegetable purées, fortified cereals, and any other suitable sources of iron.

Most of the studies on iron requirements of children have been done on infants and those of preschool age. The recommended allowances are calculated for each age group on basis of body weight.

Adolescents. No exact data are available for the requirements of this age group. The allowance of 15 mg. recommended was estimated on the assumption that needs are greater than those of the adults. Menstruation in adolescent girls means loss of hemoglobin and consequently an increased demand for all blood-building elements. Chlorosis or adolescent anemia in girls may be due to a low reserve of iron, or of other factors necessary for blood building, when menstruation begins. Languor and exhaustion result from the lack of an adequate oxygen supply to the tissues, in turn due to a lack of the transporting substance, hemoglobin, which cannot be produced without a sufficiency of the important constituent, iron. Boys are growing rapidly at this age and also need iron for hemoglobin building but are much less likely to be anemic than in the case of girls.

[2] Leverton, R. M., and Marsh, A. G.: J. Nutrition 23:229, 1942.

IODINE

Common goiter has been known since prehistoric times, but it was not recognized as a deficiency disease until the late nineteenth century. Baumann discovered iodine in the thyroid gland in 1895, and from then on iodine was used more or less as a preventive or curative treatment for endemic goiter. Before that time burnt sponge (a good source of iodine) had been a popular folk remedy for goiter.

Not until 20 years after Baumann's discovery was serious attention given to iodine as prophylaxis against goiter in large population groups. No doubt, action was stimulated by the high incidence of goiter among draftees from certain states during World War I. The map (Fig. 16) shows the distribution of goiter, which corresponds in large measure to the areas where iodine is deficient in the surface soil and the drinking water.

As a normal constituent of the thyroid gland in man and in animals, sufficient iodine must be supplied if that gland is to function normally. The amount of iodine present in the body of an adult is estimated to be about 25 mg. and most of it is concentrated in the thyroid. The minute amounts found in most animal and plant tissue have made the detection and the measuring of this factor an extremely difficult technical problem. Refined methods of analysis have demonstrated that marine fish, shell fish and seaweed are relatively high in iodine. In general, water supplies and vegetables grown in nongoitrous regions are

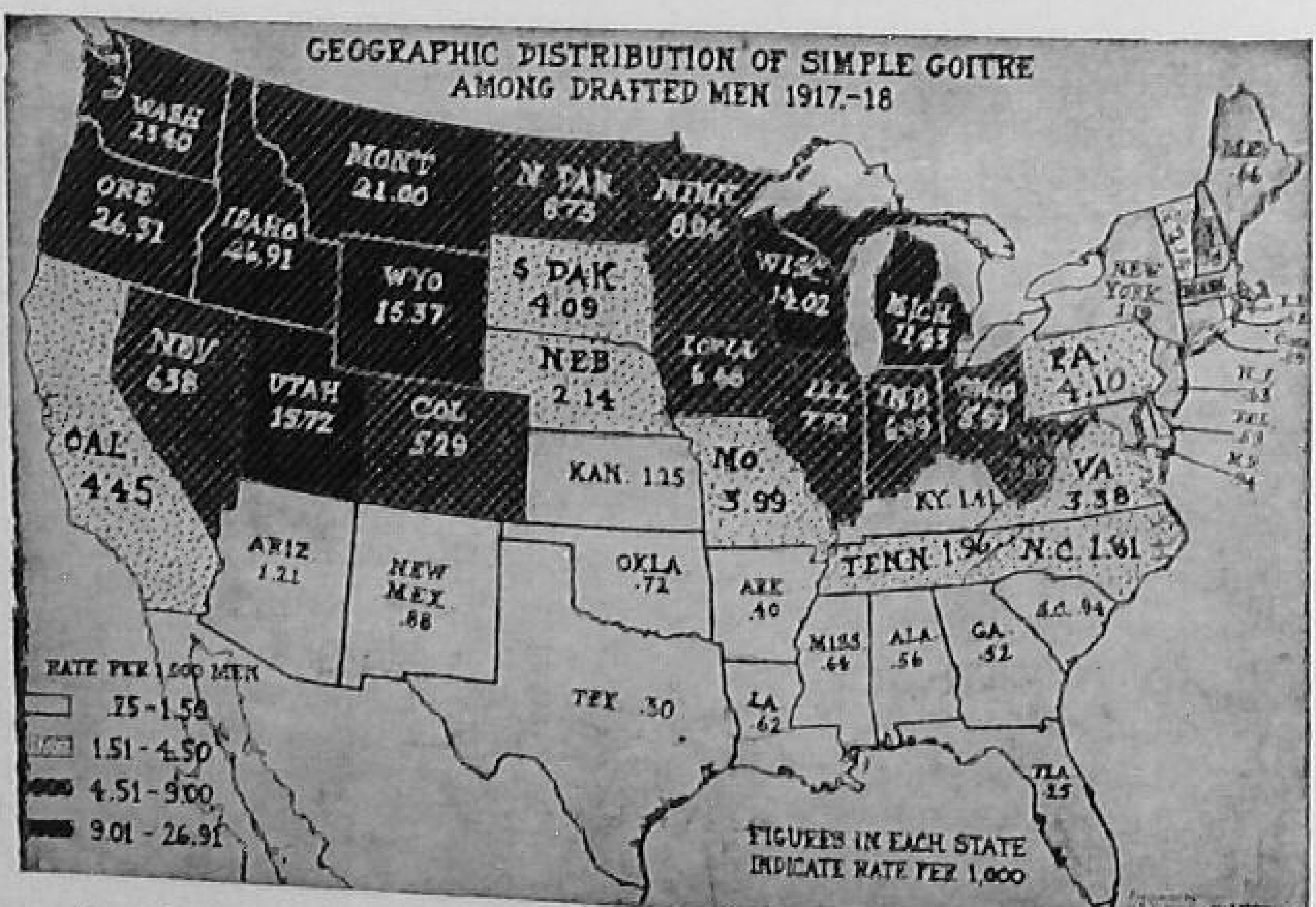


FIG. 16. Geographic distribution of simple goiter among men drafted for World War I. These goitrous areas are naturally low in iodine. (U. S. Dept. Public Health)

richer in iodine than the water and the vegetables in goitrous regions.

Iodine deficiency is characteristic of the soil of the Great Lakes region and as far south as West Virginia and of some sections of the Pacific Northwest.

Iodine and Goiter. Before surveys were made of the iodine content of soil, it had been noted that the disease of common goiter was unevenly distributed over the United States, and that it seemed to be most prevalent in the very regions where there was the least iodine. This early suspicion was confirmed, and we now recognize that common goiter is primarily an iodine-deficiency disease. The thyroid gland becomes enlarged owing to the overgrowth of the structural tissue, but there is a decrease in the actively secreting tissue, and the whole organism suffers from the lack of this internal secretion. The incidence of common goiter is higher in females than in males and is most apt to appear during adolescence or pregnancy.

Goiter Prophylaxis. The suggestion was made by Marine and Kimball that iodine might be administered to children in goitrous regions as a preventive measure. Consequently, as an experiment, iodine was administered to school children in Akron, Ohio, with remarkably successful results. By a similar project in three cantons in Switzerland the incidence of goiter was diminished during three years from 87 to 13 per cent. These demonstrations suffice to show that although the body requirements for iodine are exceedingly small, they must be met in order to prevent goiter. Many sections of the country, notably the east coast and the southern states, as well as California on the west coast, need pay little attention to this factor because iodine is indigenous. However, in the goitrous regions this was a problem requiring attention, and Michigan led the way in its solution by promoting education in goiter therapy as a public-health measure. In large cities where most foods and even water are brought from a distance, goiter may be a problem even on the coast.

Administration of iodine as a prophylactic measure against goiter had to be planned as a public health activity so that it would reach all people in an area in safe but significant amounts. The use of tablets either at home or in school was impractical, and the adding of iodine to drinking water was too expensive. Common salt is used by nearly everyone in somewhat comparable amounts. A small percentage of an iodine compound was added to table salt to be marketed in goitrous regions and an educational campaign was conducted to inform people why they should buy and use iodized salt.

This plan was adopted by Michigan in 1924, and all salt manufacturers in the state put on the market a table salt containing 0.02 per cent sodium iodide. Eleven years later the results of this plan adopted by the Michigan Department of Health exceeded the hopes of those who instigated it. The incidence of endemic goiter or enlarged thyroid had been reduced almost to nil.[3] The decrease in the sale of iodized salt that has occurred since publicity on the subject has fallen off is paralleled

[3] McClure, R. D.: J.A.M.A. **109**:783, 1937.

by a slight increase in the number of goiters in school children. The discontinuance of iodized salt in one county in Michigan was followed by a marked rise in the incidence of goiter within three years. The incidence of goiter in the public schools of Detroit from 1924 to 1935 is a striking illustration of what health education can accomplish (Fig. 17). In other states, where the use of iodized salt has not been encouraged, the incidence of thyroid enlargement has remained fairly constant over the same period of years.

In 1941, the National Study Committee on Endemic Goiter resolved that the content of potassium iodide in table salt and in salt for domestic animals should be 0.01 per cent, provided that a suitable stabilizer was used. This amount was calculated from per-capita consumption of salt to be sufficient for the prevention of endemic goiter and not great enough to cause harmful effects in other types of thyroid disorders.

In an excellent review article bringing the subject of goiter prophylaxis up to date, Kimball[4] recommends that iodized salt be put on the market for the entire country. While this recommendation has not yet been put into effect, it is being given serious consideration by public health authorities.

TRACE ELEMENTS

Many inorganic elements in addition to iodine occur in animal tissues in extremely small quantities and in some instances are detected only by spectrographic methods or by the use of radioactive elements. These are known as trace elements because they are found only in traces. However, this does not mean that they are unimportant; for it is now known that some of them are absolutely essential, while the functions of others are not so well understood. Some of the more important trace elements,

[4] Kimball, O. P.: J.A.M.A. 130:80, 1946.

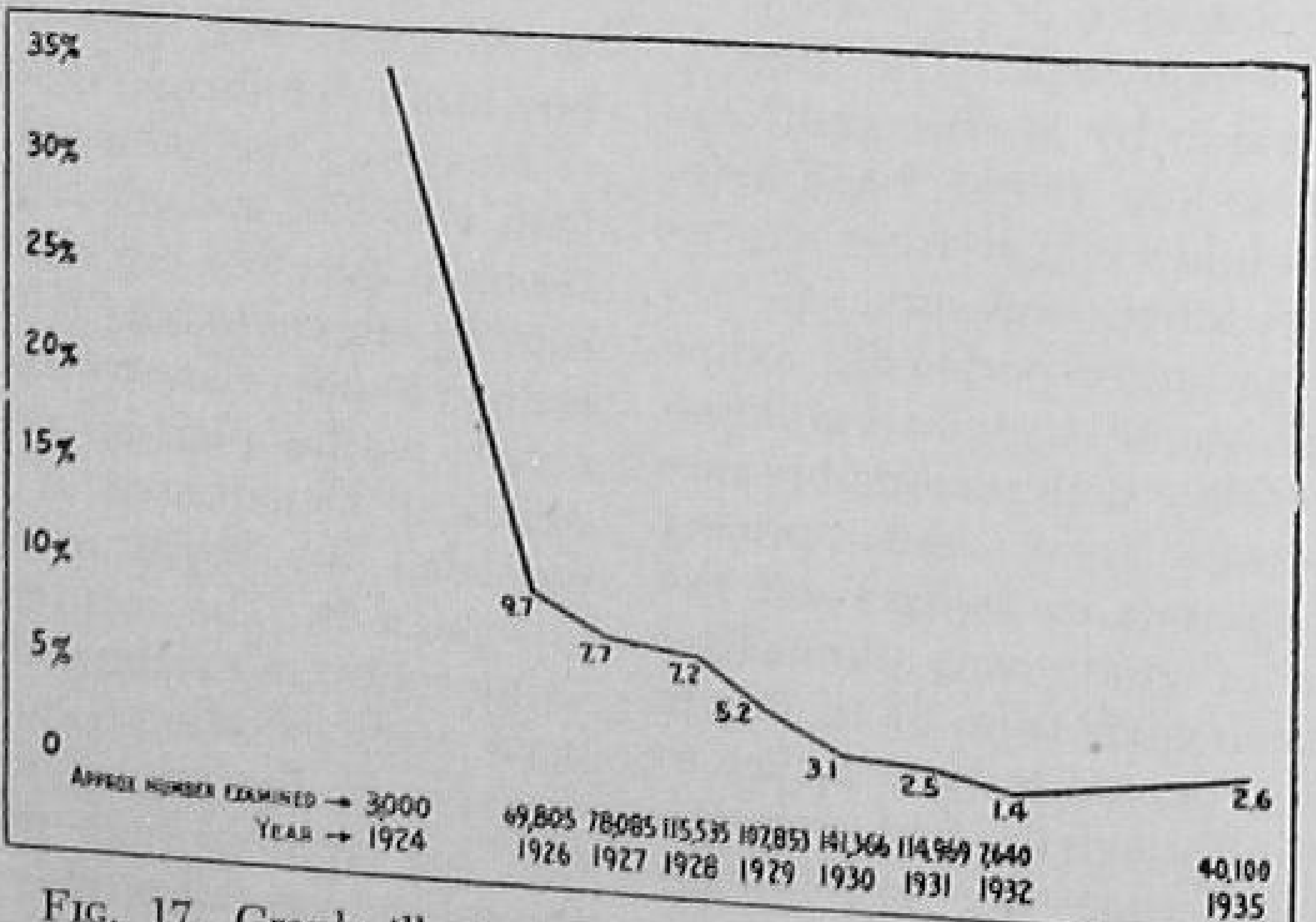


Fig. 17. Graph illustrating the incidence of goiter in the public schools of Detroit from 1924 to 1935. (Kimball, O. P.: J.A.M.A. 108:860, 1937)

such as copper and iodine, have already been discussed.

Essential Trace Elements. The trace elements cobalt, fluorine, manganese and zinc are recognized as essential to animal health.[5] Copper and iodine may also be considered in this class.

Cobalt is a component of vitamin B_{12}, a nutritional factor necessary for the formation of red blood cells. An overdose of cobalt experimentally has been shown to produce polycythemia, i.e., red cells in excess of normal. There is ample cobalt present in the average diet, and there is no danger of an excess from natural foods.

Fluorine has long been recognized as a normal constituent of bones and teeth, the dental enamel being especially rich in this element. The fluorine content of surface soils and water supplies varies widely and naturally influences the fluorine content of food grown in the region and, in turn, the level of human consumption.

Excess fluorine is now recognized as the cause of mottled enamel in the permanent teeth of children in certain areas all over the world. This condition is endemic in the United States, especially in Texas and adjacent areas, and is commonly known as dental fluorosis. The mottling occurs when fluorine is present in the drinking water in concentrations of 1.5 p.p.m. (parts per million) or more. In these same areas the low incidence of dental caries attracted comment. Subsequently, the relation of traces of fluorine in local water supplies to the low incidence of dental caries has been studied extensively.[6] The question of finding a level of fluorine in drinking water low enough to eliminate mottled enamel, but high enough to reduce the incidence of dental caries, had to be answered. It is now estimated that 1 p.p.m. is about the critical level, and if this amount could be assured in any community a reduction of from 50 to 60 per cent in dental caries could be anticipated. Topical application of fluorides directly to the teeth is reported to have reduced dental caries by 40 per cent, but data on this type of therapy are meager. Large-scale experiments now in progress in several communities will point the way for effective use of fluorine prophylaxis. Mass control of dental caries in children is indeed a possibility in the future. (See further discussion of this subject in Chap. 20.)

Manganese plays essential roles, both in plant and in animal metabolism. It occurs in all human tissues but seems to function specifically in blood formation and in certain endocrine glands. The manganese requirement of man is not known, but the average diet probably supplies enough. Blueberries and wheat bran are the richest known sources; nuts come next. The manganese content of plants is dependent upon [illegible] content.

Zinc occurs in animal and plant tissues in amounts comparable with those of iron. It is present in the human body as a constituent of a metabolic enzyme. It is considered to be essential, but no quantitative

[5] Shohl, A. T.: *Op. cit.*

[6] McClure, F. J.: J.A.M.A. 139:711, 1949.

estimates of requirements have been made.

Trace Elements of Doubtful Significance. No one has yet been able to demonstrate that aluminum, arsenic, bromine, nickel and silicon are essential to animal life. However, all are found in traces, both in animal and in plant tissues. They appear to be harmless in the amounts and the forms found in natural foods.

Contrary to an earlier popular concept, traces of aluminum from cooking utensils or in baking powders are harmless. These elements are all ingested with foods—possibly as contaminants—and are excreted largely in the stools.

Arsenic is found in sea foods and in the human body. It accumulates in hair and in nails, but its biologic function is not understood. It has been used therapeutically since the Middle Ages. Overdoses cause gastro-intestinal disturbances, but there is no danger of an excess from natural foods.

Toxic Trace Elements. Selenium and fluorine (the latter discussed previously) are the only mineral elements commonly found in food or drinking water in concentrations detrimental to human or animal health. In certain areas in the western part of the United States selenium occurs in locally grown feeds in sufficient concentrations to cause an animal disease called blind staggers. It was formerly known as alkali disease, but it is now recognized as due to an excess of selenium. So far as has been reported, this mineral is not a menace to human health. (For lead poisoning see discussion in Chap. 29.)

SODIUM, POTASSIUM, MAGNESIUM, SULFUR AND CHLORINE

Of the body minerals mentioned, sodium, potassium, magnesium, sulfur and chlorine usually are present in abundance in the average diet and do not need further discussion from that particular point of view.

Sodium chloride, common table salt, plays a regulatory role in the body metabolism, both the sodium and the chlorine performing specific functions. Animal foods probably contain enough sodium chloride for our actual needs, but with plant foods we seem to need a moderate amount of sodium chloride, as do the herbivorous animals, who are known to seek the "salt licks." This craving is due to the large amount of potassium that is present in plant tissue which needs sodium to balance it in the functioning of animal cells. In certain pathologic states this need is exaggerated. When hard work is performed in a high-temperature environment, excessive perspiration may lead to salt depletion accompanied by "heat cramps." Many industrial plants are now preventing this condition by providing for all employees water with about 0.1 per cent solution of salt or "salt tablets" to be taken with a liberal amount of water. The significance of the salt as a stimulant to thirst, thus preventing dehydration, may be even greater than the role of salt *per se*. In any case, reduction of "heat fatigue" is reported as a result of more salt and water.

Sodium, potassium and magnesium salts in solution in the blood and the lymph are chiefly respon-

sible for maintaining the osmotic pressure relation between cells and the surrounding fluids. The nice balance that is ordinarily maintained in the body may be disturbed locally when bathing in fresh water, as shown by the irritating effects on the delicate nasal membranes. However, a salt solution of a concentration similar to that of our tissue fluids is not irritating. Such a solution of 0.85 per cent sodium chloride in distilled water is known as physiologic saline. It is useful for gargles, washes or enemas, and is the basis for some intravenous solutions. Sodium and potassium also play an extremely important role in the maintenance of neutrality in the body tissues. This will be discussed later.

Magnesium is relatively abundant in muscle and in bone tissue. It probably acts with other minerals as a regulator and as a constituent of certain tissue enzymes. It forms an integral part of the complex bone salts. It is closely related to calcium in its functioning, but it cannot replace it in the tissues. The interrelationships of calcium, phosphorus and magnesium are complex, and a disturbance in the normal balance may result from or cause pathologic conditions.

Sulfur is more concentrated in hair, nails and bone matrix than in other tissues. It is an important constituent of all soft tissues and of certain substances such as glutathione and insulin. Sulfur is a component of the amino acids cystine and methionine, and, as such, is found in most protein foods. It is found also in two of the B vitamins. Thus, sulfur usually is adequate if the diet is well balanced and supplied with adequate protein.

ACID-BASE BALANCE

The maintenance of a constant acid-base balance in the blood and the tissues is a function of normal metabolism. The reaction of the blood is slightly alkaline (*p*H 7.3-7.45), varying only within narrow limits, regardless of the amount of acid products formed in metabolism. This equilibrium is maintained by a series of buffers in the blood and the tissue fluids. Buffers are able to react with either acids or bases without causing much change in the reaction of the solution.

Proteins of the blood (hemoglobin and plasma proteins) and the phosphates, the carbonates and the organic acids, all in solution in the blood, play an important role in the maintenance of this balance. Acid products formed in metabolism are disposed of either through the lungs or the kidneys. Thus carbon dioxide can be exhaled, while sulfates, chlorides and several organic acids are neutralized by the buffers and eliminated in the urine. The mechanism tends continually to deplete the alkaline elements of the blood and the tissues, but the minerals in our food replenish the supply.

When the supply of buffer substances becomes depleted due to starvation or inability to metabolize food properly, a condition of acidosis may result. Actually, the blood does not become acid, but the term *acidosis* is used to indicate a lowered alkaline reserve which results when the basic elements are used up faster than they are replenished. This may happen in severe diabetes,

Summary Table of Mineral Elements in Nutrition

(The information summarized here is given in more detail in the text.)

Element	Rich Sources	Dietary Allowance for Adults	Function in the Body	Elimination
Calcium	Milk, cheese, some green vegetables, molasses	Adult, 1.0 Gm. daily; child, 1.0 Gm. Low in average diet	Bone and tooth formation; coagulation of blood. Regulates heartbeat; aids in regulating mineral metabolism	Feces chiefly; some in urine
Phosphorus	Milk, poultry, fish, meats, cheese, nuts, cereals, legumes	1.5 Gm. daily. Usually adequate in average diet	Bone and tooth formation; constituent of cells. Aids in utilization of organic foodstuffs and regulation of neutrality	Urine and feces
Iron	Liver, meat, oysters, legumes, whole grains, green vegetables, dried fruits	12 mg. daily; more for anemic individuals	Constituent of hemoglobin, blood and tissue cells. Necessary for oxygen-carrying power	Feces (mostly unabsorbed iron)
Iodine	Sea foods, water and plant life in nongoitrous regions; sodium iodide in iodized salt	Adequate in nongoitrous regions; adult, 0.15–0.30 mg.	Necessary for normal functioning of the thyroid gland	Urine
Sodium	Common salt, sea foods, animal products	Adult, 3–6 Gm. Adequate in average diet	Regulates osmotic pressure, neutrality and heartbeat	Urine chiefly and perspiration
Potassium	Cereals, vegetables, legumes	Adult, 2–4 Gm. Adequate in average diet	Constituents of all cells. Regulates osmotic pressure and neutrality	Urine chiefly and perspiration
Magnesium	Nuts, cereals, legumes	Adequate in average diet	Necessary for mineral balance in body	Feces chiefly; some in urine
Chlorine	Common salt, sea foods, animal products	Adequate in average diet	Constituent of acid in the gastric juice. Regulates osmotic pressure	Urine chiefly and perspiration
Sulfur	Protein foods	Adequate if protein is adequate	Necessary constituent of all body tissues—hair and nails especially	Urine
Copper	Liver, nuts, legumes, cereals, dried fruits	Adult, 1.0–2.0 mg.	Aids in utilization of iron in hemoglobin synthesis	Feces chiefly

when the organic acids from faulty metabolism accumulate.

Alkalosis is the opposite of acidosis. This may occur when severe vomiting over a period of time causes a great loss of hydrochloric acid. The body quickly adjusts when the acute condition is relieved.

The reaction of the urine may vary widely in a normal individual because the amount of acid or basic end-products from metabolism will vary and the excess must be eliminated.

Conclusive evidence is as yet not available regarding the practical importance of the acid-base balance of foods in relation to health. Experience and scientific evidence indicate a wide range of adaptability on the part of the human body and do not support the "scare" propaganda with which certain food faddists promote the sale of "alkalizing" compounds to prevent acidosis.

ACID-BASE REACTION OF FOODS

The usual mixed diet contains a good balance of acid and basic factors. The basic elements sodium, potassium, magnesium and calcium may occur as salts of inorganic acids, such as phosphates, sulfates, chlorides or organic acids. When these foods are metabolized in the body, the mineral elements are released to function in maintaining the acid-base balance; the organic acids are mostly oxidized to carbon dioxide and water. Foods are said to be acid or basic according to whether the acid or basic elements predominate. Most fruits contain organic acids combined with basic elements. When such compounds are oxidized in the body, they leave an alkaline ash. Some other foods, such as cereals and meats, not at all acid in taste, yield end-products that are strongly acid. Thus by potential acidity or alkalinity of foods is meant the reaction that they will ultimately yield after being oxidized in the body.

Several workers have calculated quantitatively the excess of either acid or base as cubic centimeters of normal acid or base per 100 Gm. of edible food. These figures are referred to as degree of acidity or alkalinity. There is a difference of opinion as to the accuracy and the significance of such quantitative figures, but those commonly used are from Bridges[7] and are listed as Table 8 in Part Four. A simple classification that is easy to remember and sufficient for general use is as follows:

Potential Acid-Base Reaction of Foods

Group 1 (Acid)

Meats, fish, poultry
Eggs, cheese
Nuts (filberts, peanuts, walnuts)
Cranberries, plums, prunes
Bread and cereals

Group 2 (Neutral)

Butter
Cream
Cooking fats
Cornstarch
Sugars and sirup

Group 3 (Basic)

Fruits (except those named in Group 1)
Vegetables (except corn)
Milk
Nuts (almonds, Brazils, chestnuts, coconut)

[7] Bridges, M. A.: Dietetics for the Clinician, Philadelphia, Lea, 1941.

STUDY QUESTIONS

1. Why are minerals essential to life? Name at least three functions of minerals in the body.

2. What happens in growth if calcium and phosphorus are inadequate in the dietary? Why are these two minerals usually discussed together?

3. Milk is the single best source of calcium in the diet. See if you can write a diet which meets the calcium requirement for the adult, allowing cheese but omitting milk. Repeat, omitting both cheese and milk.

4. What situation results when the iron intake of the diet is low? Name four good food sources of iron other than liver.

5. Give the reasons underlying the supposition that adult men may need very little, if any, iron in their intake. Why will adult women continue to need small amounts?

6. Why is iodine such an essential constituent of the body? What was the situation in states lacking iodine in the soil and the drinking water before 1924? What is being done to overcome this shortage? Name the common food sources of iodine.

7. Name some of the other minerals having important roles in the body, although they occur there in relatively small quantities. What are some of their functions? Do they appear in food in sufficient quantities to meet physiologic needs?

8. What is meant by the term *trace elements*? Name one of them now under investigation in the prevention of dental caries. What are the findings about this element?

9. What is meant by acid or basic ash when referring to foods? Would a lunch of a meat sandwich, stewed prunes and coffee be predominantly acid or basic? Would this be detrimental to a normal person?

10. Are the blood and the tissues basic or acid in their reactions? How would you answer someone who said that she could not eat tomatoes "because they made her blood acid"? How does the body maintain its acid-base balance?

Properties and Functions of the Vitamins

GENERAL DISCUSSION
FAT-SOLUBLE VITAMINS
- VITAMIN A AND PRECURSORS
- VITAMIN D (CALCIFEROL)
- VITAMIN E (TOCOPHEROL)
- VITAMIN K (MENADIONE)

WATER-SOLUBLE VITAMINS
- ASCORBIC ACID (VITAMIN C)
- VITAMIN B COMPLEX
- THIAMINE (VITAMIN B_1)
- RIBOFLAVIN (VITAMIN B_2)
- NIACIN (NICOTINIC ACID)

WATER-SOLUBLE VITAMINS (CONT.)
- PANTOTHENIC ACID
- PYRIDOXINE (VITAMIN B_6)
- BIOTIN
- FOLACIN (FOLIC ACID)
- VITAMIN B_{12}
- PARA-AMINOBENZOIC ACID
- INOSITOL
- CHOLINE

OTHER VITAMINS
ANTIVITAMINS AND VITAMIN ANTAGONISTS

GENERAL DISCUSSION

The stories of the early recognition of deficiency diseases and the discovery of the vitamins are most entertaining and worthy of popular dramatization. But the interest in vitamins must not overshadow the importance of the other nutritional factors, proteins, fats, carbohydrates and minerals. Actually, the vitamins function to make possible the more efficient utilization of these other food constituents.

This chapter is a brief resume of generally accepted facts or theories regarding the function of each vitamin in normal nutrition, usable information regarding the chemistry, properties, assay methods and distribution in common foods and food concentrates. Deficiency diseases, their symptoms and dietary treatment are discussed in Chapter 19.

Definition. Vitamins are potent organic compounds which occur in minute quantities in natural foodstuffs; they perform specific and vital functions in the cells and the tissues of the body. This definition might also apply to essential amino acids or other organic compounds present in small amounts and necessary for the functioning of living tissues. The term vitamin is applied to a limited number of these compounds not otherwise classified. There is really little justification for these constituents of foods bearing the common name vitamins—they differ from each other in physiologic function, in chemical structure and

in natural distribution—but apparently the term vitamin is here to stay.

History. A few early physicians recognized the connection between food habits and the incidence of certain diseases. Beriberi was described in the seventh century and scurvy in the thirteenth, but it was centuries later that certain foods were recommended as protective. The first vitamins were discovered as "accessory factors" in foods which had proved to be curative for specific deficiency diseases. In other words, vitamins were first recognized by their absence rather than by their presence.

In the early years of the twentieth century workers in Germany, the Netherlands, England and the United States were beginning to use animals for nutrition experiments. A number of investigators showed that purified rations containing only protein, fat, carbohydrate and minerals would not support growth. They observed that natural foods provided some substances other than the basal constituents which were essential for normal growth and well-being. These workers initiated the search for "accessory food factors," later called vitamins. Since then our knowledge of vitamins has grown rapidly. The discovery and the identification of each has been reported in ever-increasing volume in current scientific literature.

Nomenclature. The term "vitamine," meaning a vital amine, was proposed by Funk in 1911 to designate a new food constituent necessary for life which he thought he had identified chemically. Other terminology was proposed as new factors were discovered, but the word "vitamin," with the final "e" dropped to avoid any chemical significance, met with popular favor.

At first the individual vitamins were named by letter or according to their curative or preventive properties, but present opinion favors names descriptive of the substance. As the chemical structure of each vitamin is discovered, it is named appropriately, if it is not already a recognized compound. However, the lettered nomenclature may still be used to some extent, especially in popular discussions of the subject. From time to time new vitamins are postulated and are added to the accepted list after extensive research.

Whenever a supposedly single vitamin proves to have more than one physiologically active fraction, the term "complex" is used after the vitamin letter to indicate the multiple nature. Even after the various fractions have been identified they may still be referred to collectively as a group—the B complex.

Sometimes it is convenient to group the vitamins according to solubility. Vitamins A, D, E and K are fat-soluble. Two water-soluble groups are recognized—those having vitamin C activity and the large group known as the vitamin B complex.

Vitamin Units and Assay Methods. Feeding tests on animals at first offered the only device for testing foods for their vitamin content. This type of procedure, called the bioassay method, is still the basis of comparison for the standardization of newer chemical or microbiologic methods of assay. As the efforts of chemists to concentrate, identify

and synthezise each vitamin have succeeded, potency has then been expressed in metric weights of pure crystalline substances.

The only vitamin values still given in International Units (I.U.) as originally defined by a League of Nations committee are vitamins A and D. All others are given in milligrams (mg.) or micrograms (mcg.), whichever is appropriate.

Determination of the specific vitamin activity of natural foods becomes an increasingly difficult task as the number and the complexity of the vitamins increase. Table 1, Part Four, gives the vitamin content of American foods in so far as they have been determined. Vitamin losses in the cooking and the storage of food will be mentioned more specifically under each vitamin, but, in general, certain principles of vitamin conservation are worth noting. Fat-soluble vitamins (A, D, E, K) are not lost easily by ordinary cooking methods, and they do not dissolve out in the cooking water. Water-soluble vitamins (B complex and C) are dissolved easily in cooking water, and a portion of the vitamins actually may be destroyed by heating; therefore, cooking food only until tender in as little water as feasible is, in general, the best procedure. Vitamin losses due to storage tend to parallel the wilting of vegetables; they are progressive in the long storage of fruits and vegetables.

Human Requirements. A natural sequence to more reliable figures for vitamins in foods has been the attempt to give quantitative estimates of human vitamin requirements. Obviously, these estimates are only approximate, based as they are upon the work of various investigators using different methods of approach. Furthermore, there may be a wide margin between the requirement to protect against a deficiency disease and the requirement for optimum health. A concept of how vitamins function in normal tissues helps in better understanding what happens when there is a deficiency. Mitchell[1] has expanded this thesis in a recent article in the *American Journal of Nursing*.

Recommended dietary allowances of vitamins and other food essentials for different age and sex categories have been establsihed by the Food and Nutrition Board of the National Research Council. This "yardstick," which may be attained by a variety of dietary patterns, makes for a wider application of nutrition than was possible when a goal was expressed in terms of foods rather than of nutritients. For popular application the goals still must be interpreted into foods commonly used. It is recommended that the table given in Chapter 9 and the explanatory paragraphs be studied in connection with the chapter on vitamins.

Terminology. Before discussing the individual vitamins there are terms that may need explanation. The word "avitaminosis" means, literally without vitamins, but it is generally used with a letter following (i.e., avitaminosis A) to indicate a specific and a complete deficiency of that factor. The word "deficiency" may be used to indicate varying degrees of shortage; thus mild, moderate, severe or complete. The possibility of an excess intake of certain vitamins has been postulated,

[1] Mitchell, Helen S.: How vitamins function, Am. J. Nursing 51:97, 1951.

and in one instance (vitamin D) a large excess has proved to be toxic. Such a condition is termed "hypervitaminosis." Early symptoms of vitamin deficiencies so vague that they are rarely mentioned to a physician are called subclinical. Recent attempts have been made to develop satisfactory criteria for judging early deficiencies. These are discussed and listed in Chapter 20.

FAT-SOLUBLE VITAMINS

Vitamin A and Precursors

Physiologic Significance. Vitamin A was the first of the fat-soluble vitamins to be recognized. This happened in 1913 when two groups of workers, McCollum and Davis, at Johns Hopkins, and Osborne and Mendel, at Yale, demonstrated independently that rats failed to grow normally on diets lacking in natural fats. At about the time growth ceased, the eyes became inflamed and apparently infected. This characteristic eye disease, known as xerophthalmia, was relieved in a few days by the addition to the diet of a little butter fat or cod-liver oil. These fats contained the protective or curative factor later known as vitamin A.

Vitamin A is a constituent of the visual purple in the retina of the eye, a substance necessary for normal vision. The visual purple is rapidly decomposed in bright light and is restored in dull light. When supplies of vitamin A are adequate this adjustment takes place rapidly. When vitamin A is deficient the adjustment to dull light is slower.

One of the earliest signs of vitamin A deficiency in man is a disturbance in light-dark adaptation, commonly known as night blindness. This is discussed more fully in Chapter 20. Long before other symptoms of vitamin A deficiency can be detected, a person may be unduly conscious of the glare of headlights in night driving. Night blindness or glare blindness may be evidence of the inability of the visual purple in the eye to adapt itself readily to changes in light intensity.

More recent work has demonstrated that the eye is not the only organ affected by vitamin A deficiency. The mucous membranes lining the nose, the throat and other air passages, the alimentary canal and the genito-urinary tracts show changes in the epithelial cells known as keratinization. Rough, dry and scaly skin, especially on the arms and thighs, is another indication of a Vitamin A deficiency. Any of these symptoms may be due to an inability to metabolize carotene, i.e., convert it into true vitamin A, even though the carotene intake is adequate.

Wherever these tissue changes occur, the natural mechanism for protection against bacteria or other foreign substances is impaired, and the tissue may easily become infected. Young rats show a high susceptibility to eye infections; older rats more often develop lung or glandular infections. Some earlier clinical observations tended to confirm these experimental findings, namely, that a liberal supply of vitamin A might increase resistance to or decrease the severity of colds and sinus, gland and ear infections. From these findings came the term anti-infective. This was not entirely justified, because the function of

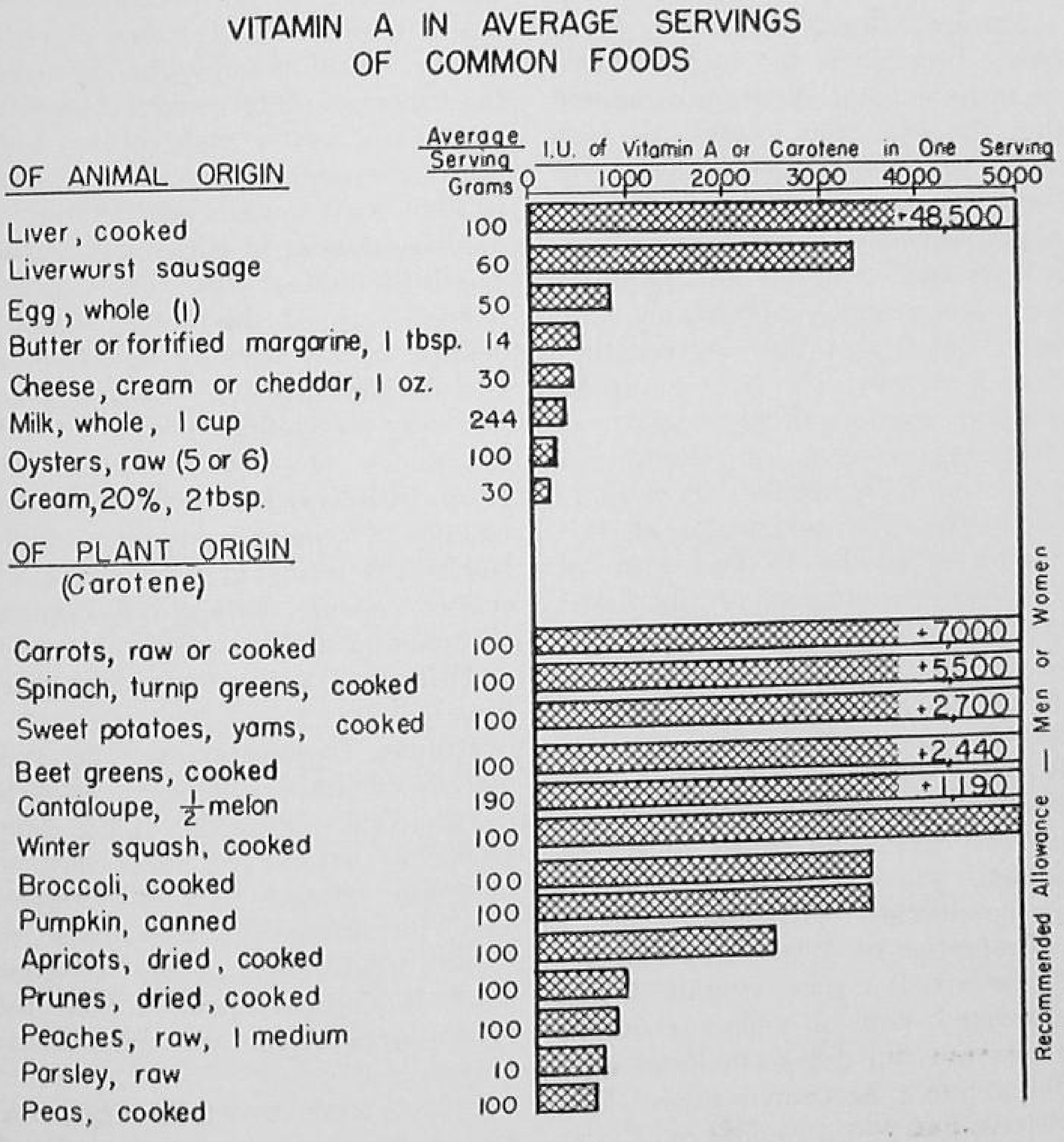


FIGURE 18

this vitamin is really the maintenance of normal epithelial cells that naturally afford the best physiologic protection against bacterial invasion.

Vitamin A is essential to normal reproduction in rats, pigs and other animals. Studies have shown that for successful reproduction and lactation the diet must furnish more vitamin A than is needed for good growth. Female rats on minimal adequate vitamin A intake may show no outward signs of vitamin A deficiency yet they are not able to bear or rear vigorous young. With an outright deficiency there is an interference with the normal estrus cycle in the female and a testicular degeneration in the male rat. Sows deprived of adequate vitamin A may give birth to litters of pigs with

defective eyes or without eyeballs.

Storage. Closely related to physiologic function is the body's ability to store vitamin A. It is estimated that the liver may contain as high as 95 per cent of the vitamin A of the entire body, with small amounts in adipose tissue, lungs and kidneys. Infants and young animals probably have low reserves of vitamin A at birth, but if they are well fed they store it rapidly. The liver gradually acquires, over a period of years, an increasing reserve of vitamin A which normally reaches its peak in adult life. The advantage of this reserve is chiefly to take care of temporary shortages or increased requirements. Obviously, an intake above minimum requirement must be maintained most of the time if such a reserve is to be built up. Reserve stores of vitamin A are evident even in young animals. It requires from five to six weeks to deplete young rats in preparation for conducting bio-assays.

Properties of Vitamin A and Its Precursors. For years vitamin A was associated with a yellow color in plants but did not seem to parallel the pigment in animal foods. This observation was puzzling until the existence of a provitamin A—the yellow pigment, carotene—was established as responsible for the vitamin A activity of plants. The true vitamin usually found in animal tissues is but slightly pigmented. It is recognized today that there are four forms of carotene that possess vitamin A activity. Betacarotene is the most abundant and possesses about double the vitamin A activity of any of the other forms. The animal body is capable of transforming these precursors into true vitamin A. This takes place in the liver and possibly in the intestines. Some animal products such as cream and butter may contain both forms, because some of the provitamin may remain unchanged.

Measurement of Vitamin A Value. The International Unit (I.U.), which is the same as the U.S.P. unit, is defined as the activity of 0.6 mcg. (or 0.0006 mg.) of betacarotene. The new crystalline vitamin A has a potency of 4,500,000 I.U. per gram. Fish-liver oils and commercial vitamin A concentrates are usually labeled in terms of I.U. per gram or per capsule. Vitamin A content of common foods usually is given in I.U. per 100 Gm. (Table 1, Part Four).

Human Requirements. The estimation of adult minimum requirements usually is based on the daily intake of vitamin A necessary to maintain normal dark adaptation. The recommended allowance of 5,000 I.U. daily for the average adult is approximately double the minimum requirement thus determined.

Infants seem to require more vitamin A to maintain a normal blood level than to prevent impaired dark adaptation. Whichever is the true measure of need, established practices of infant feeding usually ensure an adequate intake. No direct measurements of vitamin A requirements during pregnancy and lactation have been recorded, but by analogy from animal experiments the recommended allowance of 6,000 I.U. during pregnancy and 8,000 I.U. during lactation have been agreed upon as safe. (For complete table of vitamin

A allowances for all age and sex categories, see Chap. 9.)

Food Sources. Fish-liver oils are the richest natural sources of vitamin A. However, they usually are classed as food supplements rather than as foods. They vary according to species and season when caught, but commercial brands are well standardized for our convenience.

All animal livers are good sources of vitamin A, but they are not as rich as fish liver. All milk products that include milk fat, such as butter, cream or full cream cheese, are rich in vitamin A. The milk of cows on green pasture is usually higher in vitamin A than is the milk of stall-fed animals, but the color is not an index of vitamin A potency.

Carotene is abundant in carrots, from which it derives its name, but it is also present in even higher concentration in certain green, leafy vegetables and grasses in which the color of the chlorophyll masks the yellow of the carotene. In certain species such as corn there is more carotene, hence more vitamin A activity in yellow varieties than in white.

Animal foods that contain mostly preformed vitamin A seem to be more efficient sources of this factor for humans than the precursors found in plants. However, the ample supply of carotenes in plant foods may well contribute a large share of the vitamin A requirement for adults who have a normal capacity for converting carotene into vitamin A. The form of carotene found in certain yellow vegetables may not be as available as carotene from other plant sources. The chart of Figure 17 shows the relative vitamin A values of some common foods. Although animal products appear to provide less than plant products, the more available form in which vitamin A occurs must be taken into account.

Stability in Foods. Vitamin A is gradually destroyed by heating in contact with air. This seems to be a process of oxidation accelerated by high temperatures. However, a long period of heating at low temperature seems to be more destructive than a short period at a slightly higher temperature. Thus, milk boiled quickly or pasteurized by up-to-date methods still retains a large proportion of the vitamin A originally present. Improved methods of evaporating and drying milk also limit the period of heating to a minimum so that very little vitamin A is lost. Open-kettle cooking of vegetables is more destructive to this vitamin than commercial or home-canning processes, where the product is heated in closed cans. Carotene is decreased in green, leafy vegetables by drying and wilting. Cool, moist storage helps to prevent the loss. Rancidity in fats destroys vitamin A.

Vitamin D (Calciferol)

History. Rickets has been known as a deficiency disease of infants for several centuries. Renaissance painters often depicted children with rachitic deformities; probably such signs were so common as to be considered normal. The history of rickets as a deficiency disease is much older than our knowledge of how to prevent it. In the early nineteenth century cod-liver oil was a well-known folk remedy for rickets in Holland. Somewhat later it was

accepted as a therapeutic agent for rickets by physicians in Holland, France and Germany. During the latter part of the nineteenth century cod-liver oil lost favor with the medical profession because physicians could not explain its action. It was not used extensively then for many years until the period of World War I, when active research on the prevention and the treatment of rickets was inaugurated.

Early workers recognized that normal bone growth apparently was controlled by some substance in natural fats. This unknown factor was credited with some control over the metabolism of calcium and phosphorus.

Physiologic Significance. Present-day concepts of the function of vitamin D are based upon extensive research on the subject since 1921. Even today there remain many questions to be answered regarding the mechanism of action of this factor. It is not specific for rickets as vitamin C is for scurvy. The absence of vitamin D alone probably will not cause rickets, unless the proportion or the total amounts of calcium and phosphorus in the diet are inadequate. However, when the latter condition exists, vitamin D controls the metabolism of the bone-building elements so as to make possible their most efficient utilization.

The low incidence of rickets in tropical climates suggested that sunshine might play a role in the prevention of rickets. Even after it had been demonstrated conclusively that it was the ultraviolet light from sunshine or from a special lamp that aided in the healing of rickets, it was difficult to understand the con-

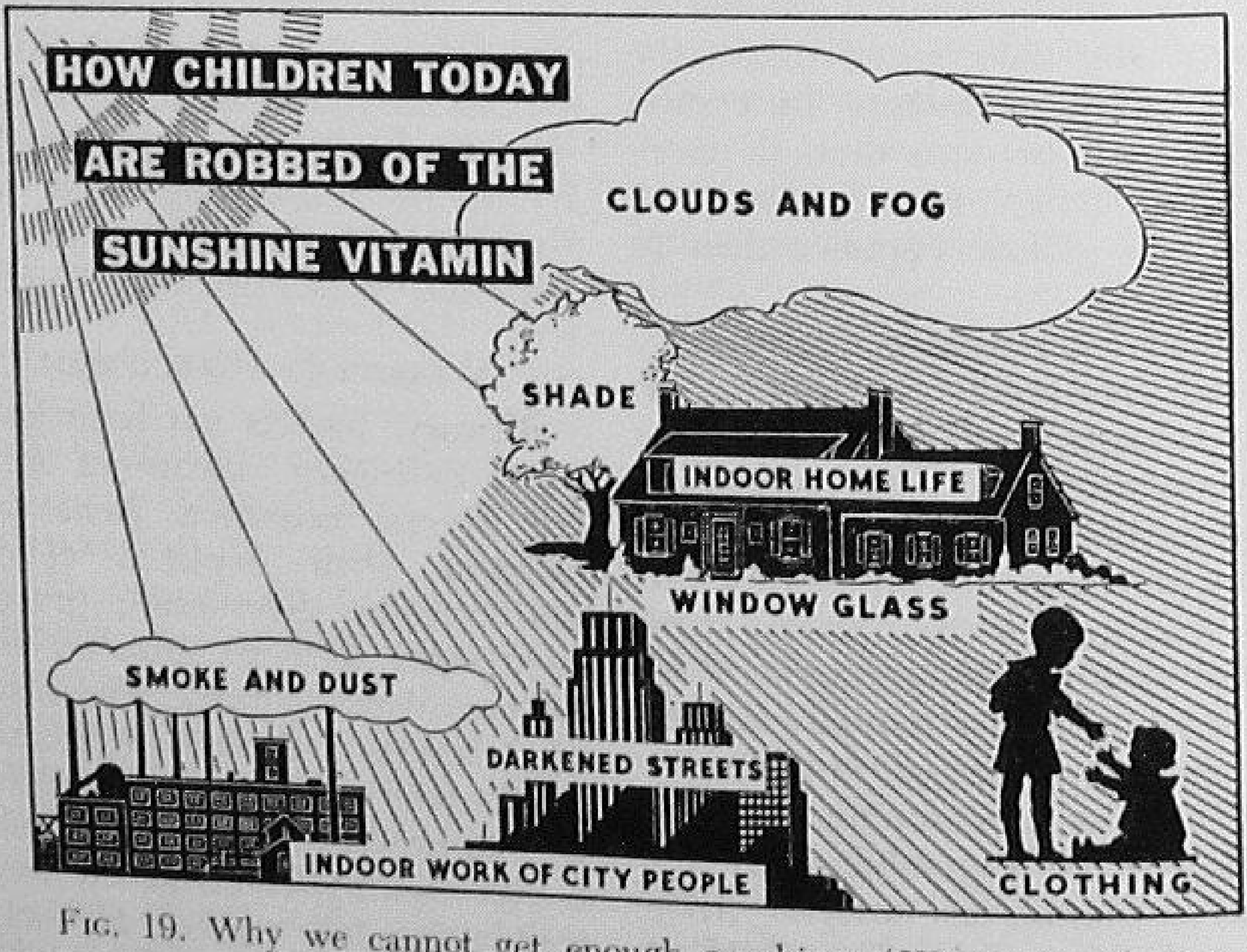


FIG. 19. Why we cannot get enough sunshine. (Wisconsin Alumni Research Foundation)

nection between this light effect and vitamin D from some food sources such as cod-liver oil. Eventually, the puzzle was solved when it was discovered that vitamin D activity could be produced in certain foods by irradiation with ultraviolet light. The oily secretion of the skin is also activated when exposed to sunlight, and by reabsorption protects the body against rickets. The amount of ultraviolet light in sunlight varies with the season and the locality, as does the total amount of sunlight. These rays are also filtered out by fog, smoke and ordinary window glass. Thus it is obvious that an adequate natural source of ultraviolet light is impossible in northern climates during the winter months.

Rickets may be produced experimentally in rats, chicks, dogs and other animals by feeding a ration disproportionately high in calcium, low in phosphorus and deficient in vitamin D or ultraviolet light. These animals will develop characteristic rachitic symptoms similar to those described in Chapter 20 for rickets in children. The deformities of leg bones and chest cavity with prominent beading of the ribs are the most conspicuous signs in a live animal.

Vitamin D is the only vitamin that has been demonstrated to have specific toxicity when administered in overdosage. Usually toxicity is not manifest except after huge doses, such as 500,000 I.U. daily (compare with daily requirements of 400 I.U.). The toxic action appears to be an exaggeration of its physiologic effects, abnormal calcification of growing bone and calcification of certain soft tissues. Headache, nausea and diarrhea may be the only subjective symptoms. Even the possibility of hypervitaminosis D, uncommon though it is, should discourage self-prescribed vitamin therapy.

Storage. Like other fat-soluble vitamins, vitamin D can be stored to some extent in the animal body, primarily in the liver. The reserve is depleted more rapidly when the calcium-phosphorus ratio is far from the normal, as it is in rachitic rations used for experimental purposes. For children who receive an adequate source of calcium and phosphorus, the requirement for vitamin D seems to be much less than for those who have a deficient intake or disturbed utilization of bone-building elements. When pregnant and nursing mothers are provided with an abundant source of vitamin D they are able to pass on some degree of antirachitic activity to the young, both prenatally and through the milk. An inadequate supply of vitamin D for the pregnant mother will predispose the young to early rickets, while offspring with better prenatal nourishment will resist the disease.

Rats to be used for vitamin D asays must be from a special colony fed on a ration low enough in this factor so that the young will not have a large reserve. Experimental rickets is difficult to produce when young rats are protected by vitamin D stored prenatally.

Properties and Forms of Vitamin D. Research on the chemical nature of vitamin D was initiated in 1924, when Steenbock and Hess demonstrated independent of each other that antirachitic activity could be induced in foods by exposure to ultraviolet light. It soon followed

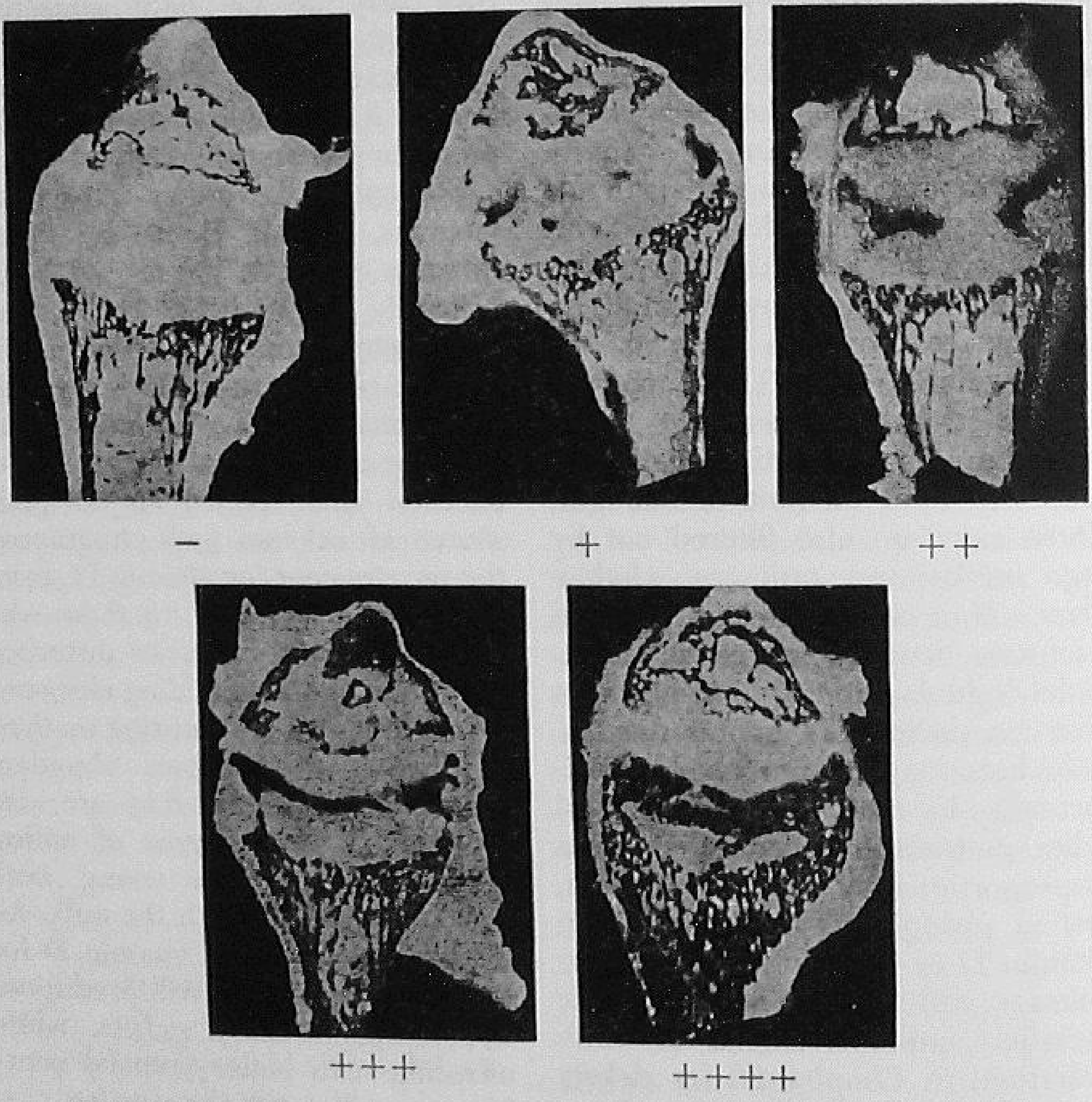


Fig. 20. Progressive degrees of recalcification or healing of rachitic bones due to graded doses of vitamin D. The increasing extent of the dark areas, where the white band appeared in the first photo, indicates mineral deposits. Photo marked ++++ represents one Steenbock or 2.7 U.S.P. units of vitamin D. (Wisconsin Alumni Research Foundation)

that the factor activated was associated with fat, and that two fatlike compounds known as ergosterol and cholesterol were the precursors from which vitamin D was produced by the action of ultraviolet rays. The two important forms are vitamin D_2 (calciferol made by irradiation of ergosterol) and vitamin D_3 (formed by irradiation of a form of cholesterol). There is evidence that vitamin D_3 may be more effective in humans than D_2. The discovery of the activation of fatlike substances by ultraviolet rays permitted the manufacture of a concentrated vitamin D preparation such as viosterol (irradiated ergosterol in oil) long before the pure crystalline vitamin D (calciferol) was isolated in 1935.

Measurement of Vitamin D. The International Unit (I.U.) of vitamin

D is the activity of .025 mcg. of calciferol. One U.S.P. unit equals one I.U.

Criteria used for judging the degree of experimental rickets are roentgenograms, total mineral content of bone and calcification of the metaphysis (the growing portion) of the long bones. The last observation has been used in developing the standardized line test on rats universally employed for routine assays of vitamin D preparations. Rats are fed on a rickets-producing diet until a definite stage of early rickets is produced, then the source of vitamin D or product to be tested is fed, and the animals are sacrificed on the 11th day. Longitudinal sections of certain bones are stained in silver-nitrate solution that darkens only the calcified areas. Figure 20 shows the progressive degrees in recalcification or healing that take place in a rachitic bone when graded doses of vitamin D are administered.

Human Requirements. Who needs vitamin D and how much is needed? These questions have stimulated much research on this subject. Jeans and Stearns[2] state the basis for requirements as "those amounts which, with ample intakes of calcium and phosphorus and a diet otherwise adequate, insure sufficient retention of calcium and phosphorus to permit (a) normal growth and mineralization of the skeleton and teeth of infants and children, (b) maintenance of bony and dental structures during adult life and (c) a sufficient supply for mother and infant during pregnancy and lactation."

[2] Jeans and Stearns: J.A.M.A. 111: 703, 1938.

A quantitative estimate for children depends upon the age of the child, the rate of growth, the type of food eaten and the exposure to sunlight. Premature and rapidly growing infants need more than others, breast-fed infants less than those fed on cow's milk, children under two years more than older children because they are more susceptible to rickets. There is some evidence that vitamin D is effective in preventing dental caries in preschool and school-age children. Thus the figures given for recommended vitamin D allowances for infants and children are subject to many variables that are covered by giving 400 I.U. The same amount is recommended for older children and adolescents.

For adults too little evidence is available to permit quantitative estimates of requirements, but many authorities believe that some vitamin D is advisable for all persons deprived of sunlight and for elderly persons. According to the Food and Nutrition Board recommendations, other adults probably have little need of vitamin D.

During pregnancy and lactation there is a definite need of vitamin D, both for mother and for offspring. Many authorities advise more than the allowances of 400 I.U. recommended by the Food and Nutrition Board. However, it is emphasized that no amount of vitamin D can lower the minimum calcium requirement (Chap. 6).

Natural and Artificial Sources. The natural distribution of vitamin D in common foods is limited to small, and often insignificant, amounts in cream, butter, eggs and liver. Thus

we have come to depend upon fortified foods, fish-liver oil or concentrates for preventive and therapeutic use.

Vitamin D milk is one of the best and most available fortified foods. Most of the vitamin D milk now on the market is produced by adding a vitamin D concentrate to the milk and is an acceptable and convenient source of this factor for infants. The present standard of 400 I.U. per quart means that a quart of milk provides a day's requirement of vitamin D. Most brands of evaporated milk also have vitamin D added. Promiscuous fortification of a variety of other foods with vitamin D does not seem either desirable or necessary.

For children who never receive any vitamin D supplement a food fortified with extra vitamin D may be desirable. The Council on Foods of the American Medical Association expresses the opinion:[3]

"Of all the common foods available, milk is the most suitable as a carrier of added vitamin D. Vitamin D is concerned with the utilization of calcium and phosphorus, of which milk is an excellent source."

Of the numerous fish-liver oils investigated there is a wide range of potency. This seems to vary with the season of the catch and the oil content of the livers. The highest potency oil often comes from fish that give the lowest yield of oil.

Concentrates are made from the natural fish-liver oils or by irradiating pure ergosterol and cholesterol. Such preparations are labeled with the exact units per dose or per capsule and are prescribed accordingly. A protective dose to meet the daily requirement is considerably less than what may be prescribed as a curative dose.

Stability. Vitamin D in foods and in food concentrates is remarkably stable to heating, aging and storage. Vitamin D milk that is warmed for the baby or the cod-liver oil that may have been kept over a season is still a reliable source of this factor.

Vitamin E (Tocopherol)

Physiologic Significance. The existence of a dietary factor essential for reproduction in the rat was recognized in the early 1920's by Evans; it was given the name vitamin E or antisterility factor by Sure in 1924. Most of the experimental work has been done on rats, the males and the females being affected differently. Vitamin E deficiency leads to destruction of germ cells in the testes of the male and thus to permanent sterility. In a female, mated with a normal male, ovulation and implantation of the ovum may take place normally but about half way through the gestation period resorption of the developing fetus occurs, and no young are born. With less severe vitamin E deficiency, which may permit the birth of a weakling litter, the chances of survival are poor because this same deficiency seems to interfere with lactation.

There is less agreement about the need of larger animals for vitamin E, but there is some evidence that cattle and swine do require it. Evidence points to a close correlation between the vitamin E content of the diet of hens and the hatchability

[3] Council on Foods: J.A.M.A. **108**: 206, 1937.

of their eggs and the viability of the chicks that are hatched. The role of vitamin E in human reproduction and its possible therapeutic usefulness in the prevention of abortion is controversial but worthy of further study.

Earlier work on nutritional muscular dystrophy in rabbits has recently been repeated with other animals, and the nutritional deficiency factor has been identified as vitamin E. Thus the so-called reproductive vitamin has come to have a new significance not associated with reproduction. Herbivorous animals are more susceptible to muscular dystrophy than are carnivorous. It is too early to say how significant this factor may be in human muscular dystrophy. Improvement in a few cases has been reported, but negative results in others.

Studies have shown that vitamin E deficiency is also accompanied by retardation of growth in the rat. This does not become apparent until later stages of growth. Changes in endocrine glands are reported to appear following vitamin E deficiency.

Storage. It requires several months for rats to use up their reserve and to become sterile due to a diet deficient in vitamin E. Vitamin E is stored in muscles and in fatty tissues and not in the liver, as are the other fat-soluble vitamins.

Properties and Forms of Vitamin E. Three naturally occurring compounds have vitamin E activity. They are fat-soluble alcohols of high molecular weight, closely related in structure and called alpha-, beta- and gamma-tocopherols. Alpha-tocopherol is the most active form. Tocopherols are more stable than most other vitamins, but they are destroyed when in contact with rancid fats. Alpha-tocopherol deteriorates on exposure to light and decomposes upon irradiation with ultraviolet light. Contact with lead and iron hastens destruction.

Vitamin E has become important in food technology because of its anti-oxidant property. It helps to prevent deterioration of certain foods by oxidation. This same characteristic may exert a protective action upon vitamin A in the body.

Measurement of Vitamin E. Alpha-tocopherol is accepted as the international standard form of vitamin E. One mg. of this material is proposed as the international unit.

Human Requirement. The uncertainty regarding the significance of vitamin E in human nutrition precludes any possibility of determining human requirement.

Food Sources. Wheat germ and wheat-germ oil afford the richest source of this factor, but it is so widely distributed in common foods that it is even difficult to obtain for experimental purposes a food mixture that is deficient in vitamin E. Tests show that vitamin E is present in cereal germs, egg yolk, legumes, nuts, leafy vegetables and vegetable oils.

Vitamin K (Menadione and Derivatives)

Physiologic Significance. A severe hemorrhagic disease in newly hatched chicks was recognized by Dam in Copenhagen in 1935. The chick ration was adequate in protein, in minerals and in all known vitamins. The hemorrhage in the

chicks apparently was due to a fall in prothrombin, the clotting agent in the blood. Normal clotting time was restored by administering hog-liver fat or by feeding alfalfa. The antihemorrhage factor found in these materials Dam called vitamin K—"Koagulationsvitamin."

This discovery and also the identification, the isolation and the synthesis of compounds with vitamin K activity has made possible extensive clinical use of this new vitamin for the control and the prevention of some types of hemorrhage. When there is a fall of the prothrombin level of the blood, such as occurs in hemorrhages associated with hepatic or biliary disease, vitamin K appears to be specific, according to clinical reports.

Vitamin K deficiency in food probably is rare, but the deficiency state is caused more likely by failure to absorb or utilize the vitamin in the food. The absorption of vitamin K from the intestine seems to be dependent upon the presence of bile and the normal digestion and absorption of fats. The use of mineral oil in reducing diets or as a laxative interferes seriously with the absorption of vitamin K. In pregnancy especially, the use of mineral oil should be discouraged, as the resulting low prothrombin level may predispose to hemorrhage, miscarriage or hemorrhagic disease of the newborn infant. After absorption, vitamin K apparently is necessary for the liver cells to perform their normal function of forming prothrombin.

Storage. Vitamin K is not stored easily in the body but, according to the information in clinical reports, whatever is stored is found in the liver.

Properties and Forms of Vitamin K. Vitamin K, the newest of the fat-soluble vitamins, is a yellowish crystalline substance. At least two forms of this vitamin (K_1 and K_2) occur naturally, and a number of simpler substances with antihemorrhagic properties have been synthesized. They are heat-resistant but are destroyed by alkalis, strong acids and certain oxidizing agents. In the concentrated form vitamin K seems to be sensitive to light.

Measurement of Vitamin K Activity. Vitamin K activity can be measured in terms of micrograms of the pure synthetic compound, and the activity of other substances can be expressed in terms of this.

Methods of assay depend upon the antihemorrhagic activity of a given material. One method uses young chicks and is based on the minimum dose that will maintain the normal coagulation time of the blood at the end of one month.

Human Requirement. For most people the vitamin K content of the average diet is adequate, and no quantitative estimate of human requirement has been attempted.

The prophylactic use of vitamin K in the prevention of hemorrhage in the newborn is now recommended and practiced in many hospitals. Oral administration of a vitamin K preparation to the mother before delivery and one dose of 1 to 2 mg. intramuscularly to the infant immediately after birth are considered by some to be a practical public-health measure.

Sources. Vitamin K is fairly widely distributed in foods. It appears abundantly in green leaves, alfalfa, casein, pork liver, soybean oil and certain other vegetable oils.

WATER-SOLUBLE VITAMINS

Ascorbic Acid (Vitamin C)

Physiologic Significance. The history of the recognition of scurvy as a deficiency disease in man and of its subsequent control by antiscorbutic foods is discussed in Chapter 20. The discovery that experimental scurvy could be produced in guinea pigs was made by Holst and Frölich in Norway in 1907. Guinea pigs develop characteristic hemorrhages around joints, teeth and other bony structures similar to the disease in man. Other animals, the rat, the chicken, the dog and certain domestic animals, fail to develop any sign of scurvy when deprived of vitamin C because they are able to synthesize this factor in their bodies. Man, monkeys and guinea pigs do not have this ability and, therefore, must depend upon the vitamin C in their food.

Vitamin C has several functions in life processes, one of which is its highly significant role in the formation and the maintenance of the intercellular cementlike substance of many tissues. A shortage of vitamin C in this connection results in weakened capillary walls leading to hemorrhages of varying degree. Other important indications of a shortage of this vitamin are structural changes in bones and cartilage, gums and teeth (dentin). Anemia due to interference with the functioning of blood-forming cells in the bone marrow, as well as a loss of blood by hemorrhage, has been recognized. If the pathologic changes have not proceeded too far, the response to the administration of liberal vitamin C dosage is striking within a few days.

Clinical experience with a number of diseases, such as tuberculosis, pneumonia and rheumatic fever, shows a decreased excretion of ascorbic acid even with an increased intake. There is some question as to whether a suboptimal intake of vitamin C is a predisposing cause of any of these diseases or whether there actually is some increased demand for vitamin C as a result of the disease. Massive doses have been administered in some cases, but results are inconclusive. Workers have shown that a shortage of this vitamin in laboratory animals lowered resistance to bacterial toxins, and that this was evident before there was any external sign of scurvy. It is essential for the normal healing of wounds and is now being used therapeutically to speed recovery from surgical operations.

Storage. The promptness with which man excretes an excess intake of vitamin C in the urine indicates limited powers of storage. The rapid appearance of symptoms of scurvy in guinea pigs on scorbutic rations is further evidence of poor storage. After periods of depletion or shortage when ascorbic acid is again supplied more vitamin is retained until the tissues seem to become saturated. Following saturation the excess is again excreted. It is generally believed that a habitual intake of vitamin C of between 80 and 100 mg. daily will keep a person in a state approaching saturation, which condition is probably more conducive to optimum health than one in which there is no reserve.

Properties of Ascorbic Acid. By 1932 the isolation of vitamin C in pure crystalline form had been accomplished by two groups of work-

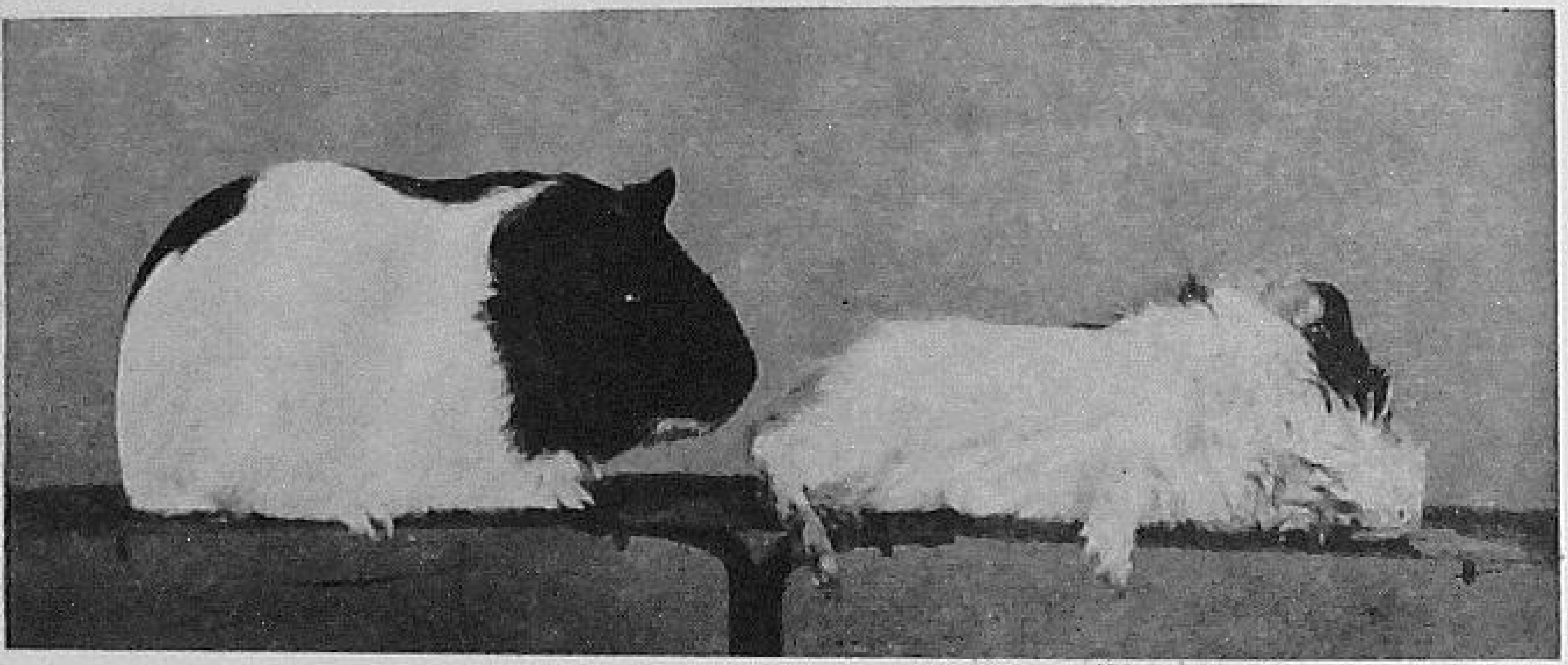


FIG. 21. Scurvy results from vitamin C deficiency. Guinea pigs are used for experiments in vitamin C because they need a food source of this factor, even as humans do. (*Left*) Normal guinea pig. (*Right*) Scorbutic guinea pig. (Nutrition Laboratory, Battle Creek Sanitarium)

ers, one in Pittsburgh and one in Hungary. The chemical structure was identified, and the product was synthesized in physiologically active form soon after that. "Ascorbic acid" was officially accepted in 1938 as the chemical name to be given to vitamin C. Ascorbic acid dissolved in water is strongly acid to taste, but in this form it is unstable. However, in fruit juices it is oxidized less rapidly, owing to the acidity of the juices and the protective substances in them. In the tablet form now being offered by numerous pharmaceutic companies, ascorbic acid is inexpensive and stable if kept free from moisture.

Measurement of Ascorbic Acid. Ascorbic acid can be conveniently measured chemically, and its potency is expressed in milligrams. It is an active reducing agent and bleaches certain dyes rapidly. This property is used in the quantitative determination in foods and tissues.

Guinea pigs always have been the preferred experimental animals for bio-assay work because of their susceptibility to a deficiency of ascorbic acid, and they are still used for demonstration and comparative assays (Fig. 21).

Human Requirement. Elaborate studies have been made to determine human requirements for ascorbic acid at different ages, under different conditions of environment, under physical exertion, in fevers and in infections. The amount necessary to prevent frank symptoms of scurvy in humans is far less than that recommended for an optimum state of health. Saturation tests after graded levels of intake and observations on blood ascorbic acid have been the chief technics used for studying human requirements. On the basis of such studies the National Research Council recommends 75 mg. for an average man and 70 mg. for a woman, 100 mg. during pregnancy and 150 mg. during lactation. Growing children need relatively more than adults. (See table, Chap. 9.) During and following fevers and infections the demand for ascorbic acid seems to be increased, either

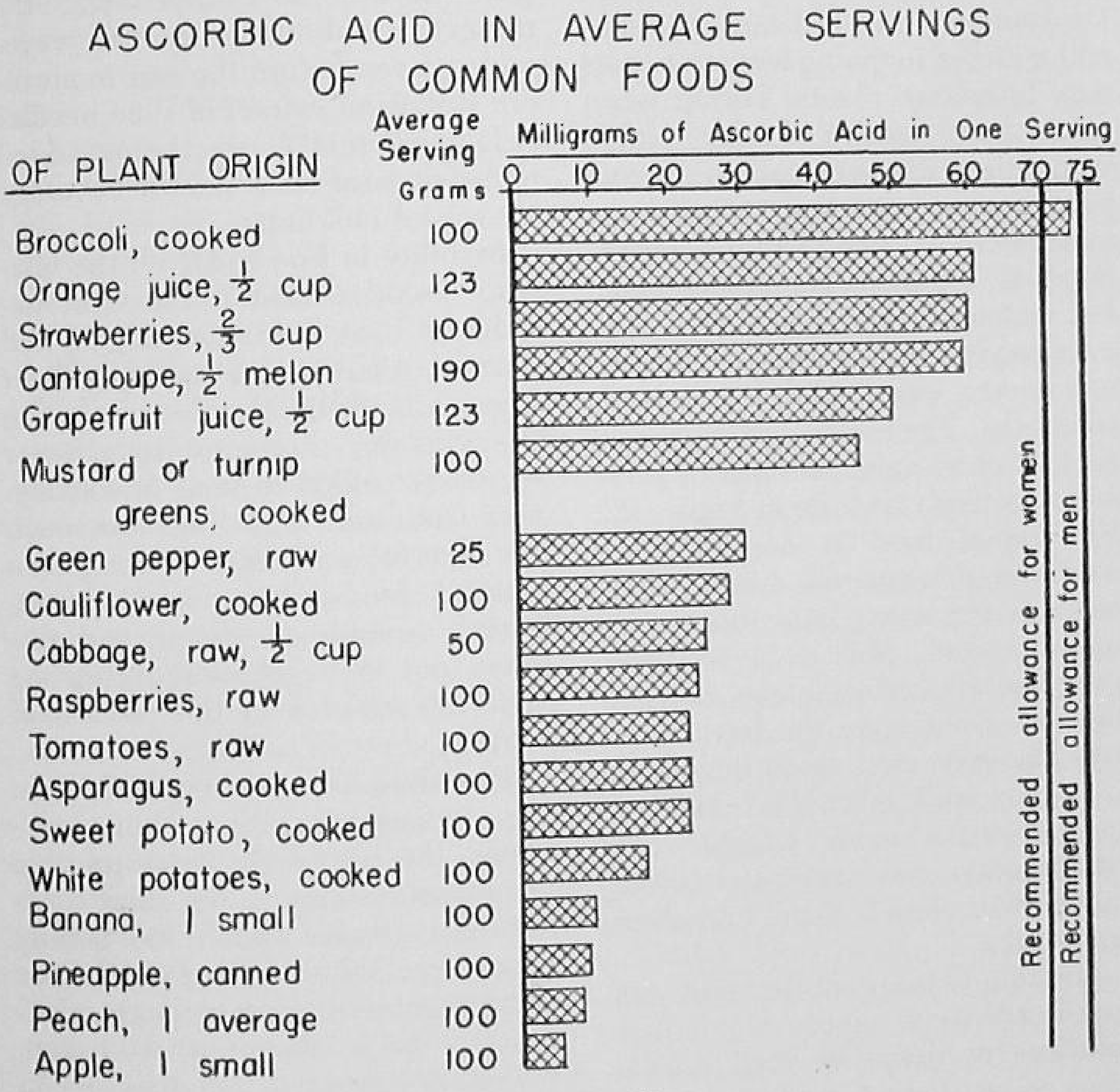


FIGURE 22

because of rapid destruction or of an increased need. A regular and adequate intake of ascorbic acid is emphasized because of the poor storage and constant need. Food sources are usually adequate, except in pathologic states or when fresh foods are not available.

Food Sources. Citrus fruits and several tropical fruits and a number of raw, leafy vegetables are rich sources of vitamin C. Tomatoes and other fruits and vegetables, even when canned, furnish a liberal supply of this factor. Canned or frozen citrus juice may be the cheapest source of vitamin C when fresh citrus fruit is scarce or expensive, and may even be cheaper than tomato juice unless home-canned, because it takes twice as much or more tomato to supply the same number of units of vitamin C. In season, strawberries or melon may replace citrus fruits

as equally good sources of ascorbic acid. Ascorbic acid is synthesized in the young sprouts of beans or grains and is richer in young leaves or roots than in mature plants. Turnip when eaten raw has a higher value than other root vegetables. Turnip juice was an important antiscorbutic in northern Europe in World War I. Potatoes, although containing much less vitamin C than many other common foods, may become an important source when a large amount is consumed. The relative ascorbic acid content of average servings of some common foods is given in Figure 22. No animal food is an important source of this vitamin. Liver, which contains the most, loses much of it when cooked. Milk is a relatively poor and a variable source, depending somewhat upon the feed of the cow and even more upon the way in which the milk is handled. Mother's milk contains more ascorbic acid than average cow's milk and considerably more than is found in pasteurized milk.

Vitamin C is one of the most difficult nutrients to supply in adequate amounts to troops or civil populations in wartime because of its instability in stored foods. In World War II the need for a liberal amount of this factor was recognized, and army rations included a lemon powder fortified with ascorbic acid. Most of the other items in the emergency ration contained very little vitamin C. If men did not like lemonade, as was frequently the case, the ration was low in this factor. Civil populations in north temperate zones, deprived of imported fruit, fell back on native sources. In Great Britain, rose-hip and black-currant sirups or jams served to supplement the meager supply from garden vegetables. Even before the war in northern Russia an extract of pine needles rich in vitamin C was being added to berry juice as a health beverage for school children.

Stability in Foods. Of all the vitamins, ascorbic acid is the most unstable to heat, oxidation, drying and storage. Alkalinity, even in a slight degree, is distinctly destructive to this vitamin; therefore, soda never should be added to food in cooking. Acid fruits and vegetables lose much less ascorbic acid upon heating than nonacid foods. Vitamin C is extremely soluble in water and dissolves out of vegetables during the first few minutes in the process of cooking.

To reduce as much as possible the loss of ascorbic acid in cooking vegetables, the use of the least possible amount of cooking water, short cooking time (water should be boiling when vegetable is added) and little chopping or cutting is recommended. Studies have shown that baked, boiled or steamed potatoes retain a large proportion of their vitamin C if cooked whole. Fresh fruits and more especially vegetables lose vitamin C activity rapidly when stored at room temperature and somewhat less rapidly at refrigerator temperatures. Expert advice is not to shell peas, cut beans, peel vegetables or cut roots off spinach until ready to cook. Quick freezing of fruits and vegetables destroys little if any of this factor. To retain a maximum of the ascorbic acid, frozen fruits should be used promptly after thaw-

ing, and frozen vegetables should be plunged directly into boiling water for immediate cooking.

Vitamin B Complex

Discovery and Early Significance. As early as 1897, Eijkman, a Dutch physician stationed in Java, noticed that the poultry at the prison hospital showed symptoms similar to those of his patients suffering from beriberi. This malady developed in the chickens when they were fed on the polished-rice table scraps thrown out from the prison, and recovery followed when other food was given. The results of the investigation were published in an obscure journal and were interpreted wrongly at first, but years later attention was given to the findings, and great scientific significance was attached to them. Eijkman had discovered that there was a deficiency in polished rice, but he did not realize its significance.

Experimental work with rats, pigeons and dogs during the early part of this century led to the recognition of a hitherto unknown food essential that came to be known as vitamin B. Animals deprived of this factor lost appetite, ceased to grow and often developed characteristic symptoms of polyneuritis, a loss of muscular control and partial paralysis. Many of these symptoms in animals were similar to those of beriberi in man, particularly the effect upon the nervous system.

Subdivision into Separate Factors. Numerous workers began to observe a complexity of symptoms due to deficiencies among peoples with different dietary patterns. These reports were confusing until the discrepancies in experimental findings and the diversity of physiologic properties ascribed to this so-called vitamin B led to the recognition of several factors instead of one. From then on the group was known as the vitamin B complex, and each fraction received separate designation—letter, descriptive name or chemical term—as research progressed to disclose the chemical nature of each.

At present some 12 fractions of the vitamin B complex are generally recognized, and others are postulated. Those discussed in this chapter are thiamine, riboflavin, niacin, pantothenic acid, pyridoxine, biotin, folic acid and vitamin B_{12} with brief comments about several others.

Distribution and Properties. Certain properties, the solubility in water and the distribution in many common foods are common to all members of the B complex. The very fact that several of the fractions occurred together in the same food gave rise to the early idea that there was only one substance. New factors identified are classified as belonging to the B complex if they are water-soluble and are abundant in liver and yeast. Dry yeast is the richest natural source of the B complex, and new strains of yeast are being developed with varying proportions of the different factors.

Therapeutic Use. Concentrates of vitamin B complex manufactured by pharmaceutic houses usually are made from liver, yeast or rice polishings. The proportion of the various factors present depends somewhat upon the source or the combination of sources. Synthetic vitamins may be combined in any desired propor-

tion in the preparation of B complex mixtures. Obviously, a proportion of factors corresponding approximately to human need would be most desirable. It is concluded from clinical work that the whole B complex is superior therapeutically to any single fraction.

THIAMINE (VITAMIN B_1)

Physiologic Significance. The polyneuritic symptoms recognized by Eijkman in his chickens and the beriberi in man described by numerous workers in the Orient were concerned with the vitamin B_1 fraction of the B complex. In 1910, R. R. Williams became interested in beriberi in the Philippines and in the curative effects of rice polishings. He started a 25-year search for the active principle in rice polishings, bran and other natural foods. Later it was named thiamine, as descriptive of its chemical nature.

Even a mild deficiency of this factor may cause anorexia (loss of appetite) and inanition in all types of animals and man. Early recognition of the necessity of this vitamin for normal growth has since been supplemented by the knowledge that it is important throughout life in tissue respiration. There is an intricate interrelationship between thiamine and carbohydrate metabolism in the tissues. Authorities have recognized for some time that the human requirement tends to parallel the total caloric intake.

A common complaint often due to a mild thiamine deficiency, but not always recognized, is atonic constipation and poor intestinal muscle tone. It is possible that the muscle-nerve mechanism of internal organs is more susceptible to this deficiency than that of the skeletal muscles, which become paralyzed only when the deficiency is severe. Certain British workers suggest that the degree of slowing of heartbeat (bradycardia) may be indicative of this deficiency.

Work conducted at the Mayo Clinic has disclosed the characteristic syndrome of early thiamine deficiency in human subjects. Thiamine alone was restricted in the diet of some nurses and other volunteers. These subjects were under careful supervision as to food, and the urinary excretion of thiamine was also checked. Williams *et al.* summarize their findings as follows:[4]

"The degree of disability induced by withdrawing thiamine from otherwise adequate diets of these persons was impressive. Fatigue appeared, interest in daily tasks was lost, accompanied by discouragement, depression and irritability. Appetite was lost. Multiple neurasthenic complaints were heard. The heart sounds became faint, blood pressure fell, the pulse was irritable, and as the duration of the restriction was prolonged, abnormalities in the action of the heart and mobility of the stomach and intestine could be recorded with special apparatus."

Storage. Thiamine cannot be stored to any extent in the animal body. Therefore, it is important that it be supplied regularly in the diet. In America the food supply is such that one is relatively sure to have enough thiamine to prevent beriberi, but frequently not enough to ensure

[4] Williams *et al.*: Arch. Int. Med. **66**: 785, 1940.

THIAMINE IN AVERAGE SERVINGS OF COMMON FOODS

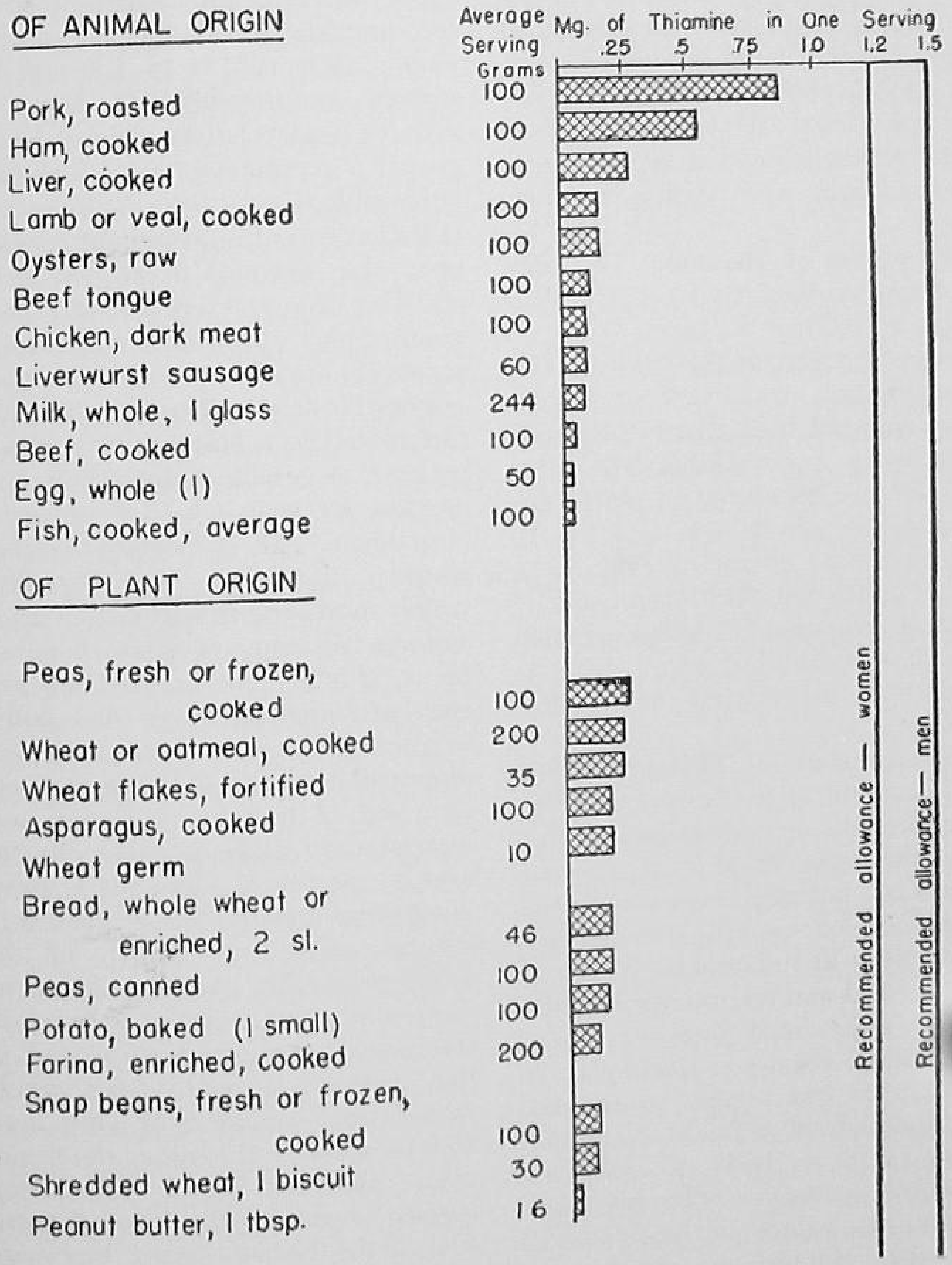


FIGURE 23

optimum health. Many a vague symptom of tiredness or chronic constipation may be aggravated by suboptimal intake of thiamine. Many animals, especially cattle and other ruminants, synthesize thiamine and other factors of the vitamin B complex by bacterial action in the alimentary tract. When the bacterial flora of the intestine is favorable, humans may also synthesize thiamine.

Properties of Thiamine. Thiamine was first synthesized by R. R. Williams in 1936 as a climax to his 26 years of interest in the subject. The pure vitamin, usually sold as thiamine chloride, has a yeasty taste and odor and is water-soluble. The natural and the synthetic products are identical in physiologic activity. In the dry state thiamine chloride is stable and is not easily destroyed by heat or oxidation. In water solution it is less stable, but more stable in acid than in neutral or alkaline medium.

Measurement of Thiamine. Thiamine content of foods may be given in milligrams or micrograms (1 mg. = 1,000 mcg.). Human requirements and potency of synthetic compounds or concentrates are expressed more often in milligrams.

Chemical and microbiologic methods of assay have largely replaced the older bio-assay methods, in which rats and pigeons were used as experimental animals. Now that these rapid methods of assay are available, extensive determinations of vitamin values of foods before and after storage and cooking are possible, and tables of food values are being revised to include such figures.

Human Requirements. Adult human thiamine requirements tend to parallel energy expenditure except for extremes of caloric intake. Thus the Food and Nutrition Board recommends from 1.2 to 1.8 mg. for men and from 1.0 to 1.5 mg. for women, varying with the degree of activity, and relatively more during growth, pregnancy and lactation. (See table, Chap. 9.)

Estimation of requirement is based upon the response to graded doses and the urinary excretion of a marginal surplus compatible with a sense of well-being.

Food Sources. Thiamine is widely distributed in a large variety of animal and vegetable tissues, but there are few foods in which it occurs in abundance. This is strikingly emphasized in the chart (See Fig. 23), which shows the thiamine content of average servings of some common foods. It is evident that it takes several servings of even the better sources of thiamine to meet the recommended allowance. Therefore, enrichment of bread and cereals was instigated to make it easier for the average person to meet his requirement economically. Since bread constitutes about one fourth of the calories in the average American diet, and since only a very small fraction of the bread consumed in this country is made from whole wheat, the enrichment of white flour and bread with thiamine, riboflavin, niacin and iron was a logical step toward improving the level of nutrition in the United States. For more details about enriched flour and bread see Chapter 48.

Dry yeast and wheat germ are the richest natural sources of thiamine,

but they are used only in relatively small amounts. Moist baker's yeast has only from one eighth to one tenth of the thiamine potency of brewer's yeast. Except for pork, which is outstanding, muscle meats contain less than the organs, such as liver, heart and kidney. Fruits in general are poor sources of this vitamin.

Stability in Foods. The factors most destructive to thiamine in foods are prolonged heating and alkali. In acid foods this vitamin is quite stable, but its activity is destroyed rapidly by sulfite, a fact which may explain the loss of thiamine in dried fruits, such as apricots and peaches, treated with sulfur.

The loss in cooking is dependent upon several factors, such as type of food, method of preparation, temperature, length of cooking and acidity or alkalinity of the cooking medium. Research on the losses of nutrients in food processing indicates that on the whole fresh vegetables retain thiamine well during cooking. From a trace to 15 per cent is dissolved in the cooking water, and up to 22 per cent may be destroyed by cooking. If the cooking water is discarded, thiamine losses may be from 20 to 35 per cent.

Thiamine is well retained in cereals, since they generally are cooked slowly and at a moderate temperature and the cooking water is used. Baked products lose about 15 per cent of their original thiamine. Generally, the losses in cooking meat are greater than in other foods, ranging from 25 to 50 per cent of raw value. Foods stored in their natural condition lose remarkably little thiamine.

Riboflavin (Vitamin B_2)

Physiologic Significance. The second member of the B complex–riboflavin–was synthesized in 1935. This factor is associated with normal growth and development, both in mammals and in birds. Like thiamine, riboflavin plays an important role in tissue respiration. It combines with phosphoric acid and protein to form enzymes that control some of the oxidations involved in the life processes of living cells.

Sebrell and co-workers have demonstrated that riboflavin deficiency in man may be characterized by pallor of the mucous membrane of the lips and splitting of the lips at the angles of the mouth, a condition known as cheilosis.

Riboflavin also plays an important role in relation to the eye. Ocular symptoms appear consistently on a low riboflavin diet and may precede all other manifestations. Eyestrain and fatigue, itching and burning, sensitivity to light and frontal headaches are the most frequent complaints. Cataracts have been observed in rats, mice, chickens and monkeys after prolonged deficiency of riboflavin. Such a diet may lead also to neurologic abnormalities with myelin degeneration of peripheral nerves and spinal cord in experimental animals. In man, riboflavin deficiency is apt to occur along with a deficiency of other members of the B complex.

Storage. There is no great storage capacity in the body for this vitamin. It has been suggested that under stress the body can conserve its store of riboflavin much better than it can conserve thiamine.

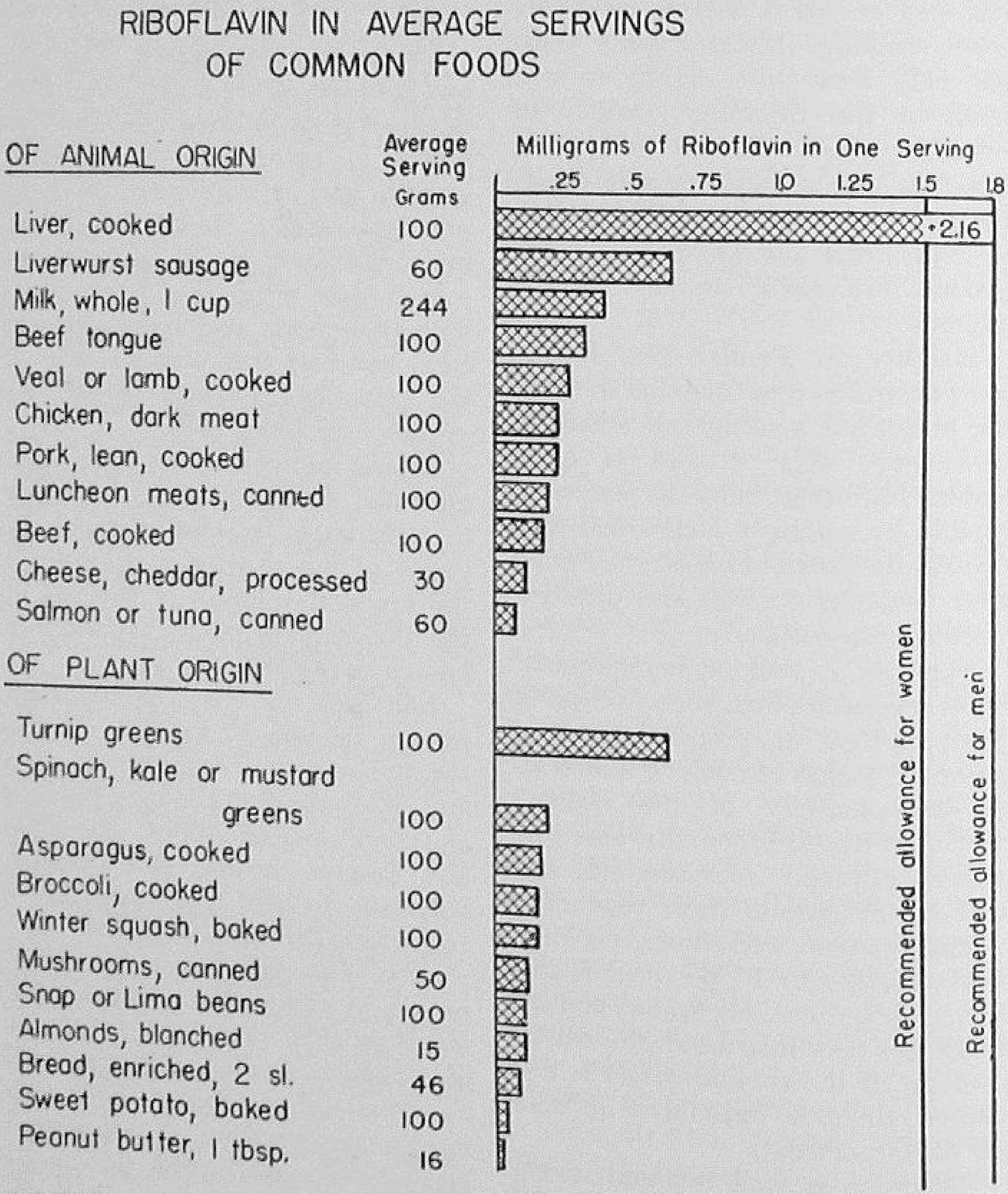


FIGURE 24

Properties of Riboflavin. Riboflavin crystallizes in a cluster of yellow needles, and in water solution it has a yellow-green fluorescence. Although it is stable to heat, acid and oxidation, it is sensitive to alkali and is easily destroyed by light. This vitamin always should be kept in dark bottles.

Measurement of Riboflavin. The only reliable unit for riboflavin is the metric weight of the pure substance. Human requirements for this vitamin are expressed in milligrams and the amount in foods in milligrams or micrograms (1 mg. = 1,000 mcg.).

Physical-chemical and microbio-

logic methods of assay are used for determining the riboflavin content of foods, tissues, etc.

Human Requirement. Unlike thiamine, the human requirement for riboflavin does not seem to be related to energy expenditure. The Food and Nutrition Board recommends 1.8 mg. for men and 1.5 mg. for women regardless of activity. The greater relative need for riboflavin during growth, pregnancy and lactation is reflected in the specific recommendations for these categories. (See table, Chap. 9.)

Food Sources. Riboflavin is widely distributed in animal and in vegetable foods, but only in small amounts in most of them. Organ meats, milk and green leafy vegetables are the outstanding food sources. This is strikingly emphasized in Figure 24, which shows the riboflavin content of average servings of some common foods and the contribution they make toward the day's requirement.

Dry yeast is the richest natural source, but this product is not generally consumed in large amounts. The average person is not apt to get an optimum amount of riboflavin unless he consumes a generous amount of milk. The addition of riboflavin in the enrichment of flour and bread has helped to raise the average intake.

Stability in Foods. Studies have shown that riboflavin in aqueous solution is destroyed rapidly by light. Several investigators have made tests of the amount of destruction of riboflavin in milk, since it is an important source of this vitamin. Results of these studies show that the destruction by light is significant and likely to be more serious while in the bottle that has been left outside the door than during processing or cooking. One half or more of the riboflavin is lost in 2 hours if milk bottles are allowed to stand in sunlight.

Niacin (Nicotinic Acid)

Physiologic Significance. When Elvehjem reported the spectacular cure of blacktongue in dogs by means of nicotinic acid, now known as niacin, the logical supposition was that a niacin deficiency might be the cause of pellagra in humans. Later Spies and others demonstrated that most of the classic symptoms of pellagra were relieved by the administration of niacin. However, most persons suffering from pellagra have multiple deficiencies, and it has been found that certain symptoms formerly associated with the disease are not relieved until thiamine and riboflavin are supplied along with niacin. Earlier concepts of pellagra being related to a protein deficiency have been clarified by the discovery that one of the amino acids, tryptophane, is a precursor from which niacin may be synthesized in the animal body. Niacin is associated also with the enzyme systems in tissue respiration. Human pellagra is discussed fully in Chapter 20.

Storage. Little is known regarding the extent of storage of niacin in the body, but probably it is stored in the liver. It is eliminated in the urine largely as derivatives and, to a smaller extent, as free niacin. This diversity of end-products has added to the difficulties of metabolic studies in niacin.

Properties of Niacin. Nicotinic acid has long been known as a simple organic compound, but its

physiologic properties were not appreciated until it was isolated from potent liver concentrates by Elvehjem and associates in 1937. In the dry state it is a very stable compound and, unlike some other members of the B complex, it is even stable to alkali. It was renamed niacin instead of nicotinic acid because it had none of the physiologic properties of nicotine found in tobacco.

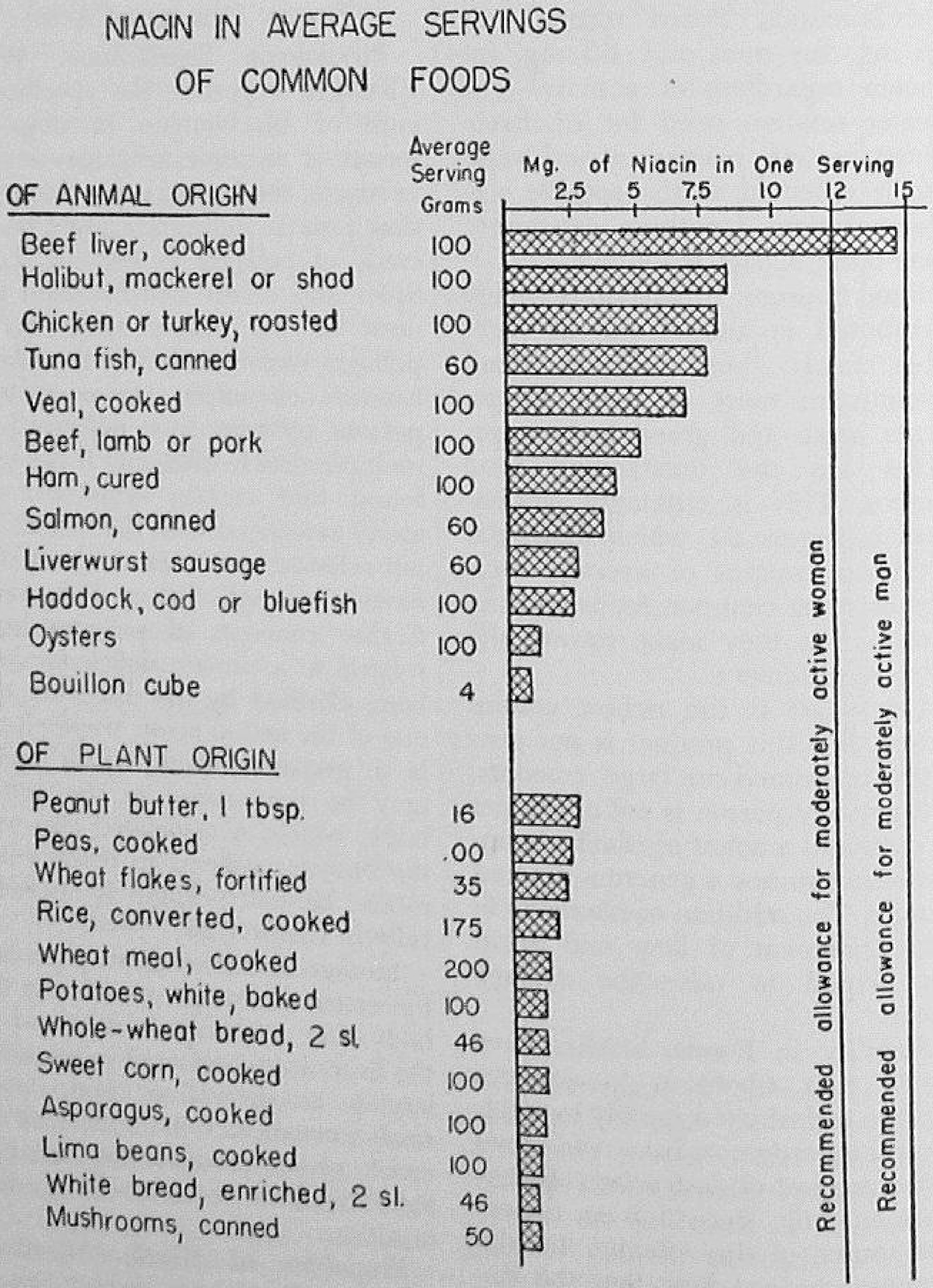


Figure 25

Two forms of this vitamin, niacin and niacinamide, have antipellagra activity. Therapeutic doses of niacin may cause temporary flushing or hot flashes, but niacinamide does not produce this reaction.

Measurement of Niacin. Niacin in foods and niacin requirement are both expressed in milligrams of the pure chemical substance.

Chemical and microbiologic methods for niacin assay are now used generally in place of animal assays. Dogs were the only animals with which early bio-assays could be made, and such tests were based upon the blacktongue-preventing value.

Human Requirement. Evidence on the human requirement for niacin is rather meager. Most of the clinical evidence is based upon doses of niacin effective in the cure of pellagrous symptoms, and it is well known that curative doses are usually much larger than preventive ones. It has been assumed that niacin requirement may vary with energy expenditure, as seems to be true with thiamine. The Food and Nutrition Board recommendation of from 12 to 18 mg. for men and from 10 to 15 mg. for women is the best estimate possible at the present time, but it varies with the quantity and quality of protein in the diet.

Food Sources. In general, meat, poultry and fish are better sources of niacin than plant products, as emphasized in Figure 25, showing average servings. The use of meat drippings is recommended because niacin is easily dissolved out of foods in cooking. Whole-grain and enriched products make an appreciable contribution because they usually are consumed in generous amounts. Fruits and vegetables other than mushrooms and legumes are insignificant sources of niacin. Milk and eggs are poor sources.

Pantothenic Acid

Physiologic Significance. Pantothenic acid, earlier known as filtrate factor, yeast growth factor or chick antidermatitis factor, is another of the vitamin B complex group. It is essential for the well-being of rats, dogs, pigs and pigeons, as well as chicks, but its specific function is not well understood. The complete synthesis of pantothenic acid was accomplished in 1940 by the joint efforts of several groups of workers. A deficiency of pantothenic acid has been reported to cause emaciation, loss of hair and graying of hair in dark animals, ulcers of the intestinal tract, tissue dehydration, damage to adrenal, kidney or heart tissue and a special type of nerve degeneration that results in a goose-step gait.

Clinical observations indicate that it may be essential to human nutrition, but its function is not yet clearly defined. It may be associated with riboflavin in the normal functioning of tissue enzymes and is stored in the liver and, to a lesser extent, in the kidneys and other organs.

Food Sources. The name pantothenic, meaning widespread, indicates that the distribution of this vitamin is extensive. Figures on the pantothenic-acid content of foods are limited in number. Yeast, liver, kidney, heart, salmon and eggs are the best sources. Other good sources are broccoli, mushrooms, pork, beef tongue, peanuts, wheat, rye and soy-

bean flour. About one half of the pantothenic acid is lost in the milling of grains, which constitute an important, if not a rich, source of this factor in the average diet. Fruits are relatively poor sources of this vitamin.

Pyridoxine (Vitamin B_6)

Physiologic Significance. Pyridoxine was identified in 1938 as a separate fraction of the B complex. Previously, pellagralike symptoms in rats were found to be due to a pyridoxine deficiency. Now it is established that this factor is required by all animals. A deficiency is associated with peculiar type of anemia in several species. Extreme muscular weakness, dermatitis and certain nervous disorders also have been observed in pyridoxine deficiency.

Therapeutic use of pyridoxine in treatment of Parkinson's disease and other types of muscular weakness in humans has met with variable response. In combination with other B vitamins it has been used in the treatment of nausea and vomiting of pregnancy and in radiation sickness with some success.

The mechanism of the action of pyridoxine and its several derivatives has been studied extensively. It is associated closely with the synthesis and the metabolism of the amino acid tryptophane. It also functions in the enzyme system which facilitates the utilization of amino acids by the tissue cells. How the biochemical activities of pyridoxine and its derivatives relate to the deficiency symptoms manifest by skin, blood and muscle is yet to be explained.

Food Sources. Of the animal foods, pork and the glandular meats are the richest, with lamb and veal relatively better than fish or beef muscle. Milk and eggs are poor sources. Of the plant foods, legumes, potatoes, oatmeal, wheat germ and bananas are the richest, with cabbages, carrots and other vegetables providing fair amounts. The pyridoxine content of foods is determined by a microbiologic method.

Biotin

Physiologic Significance. Biotin, another member of the vitamin B complex, was first isolated in 1936 as a growth essential for yeast.

Previous to this date numerous workers had described factors called by various names but having similar antidermatitis properties. These several factors proved to be identical and are now known as biotin. Investigations have shown that a biotin deficiency can be produced in rats, rabbits and monkeys by feeding a substance called avidin found in raw egg white. Avidin inactivates biotin and is known as an antivitamin (see last paragraph in the chapter). Chicks and turkeys exhibit characteristic dermatitis, even when no antivitamin is fed. Observations to date indicate little concerning the possible significance of biotin in human nutrition.

Food Sources. Few foods have been analyzed for this factor. It is abundant in liver and other organs, in yeast, mushrooms and peanuts. Lesser amounts occur in milk, eggs and certain vegetables and fruits.

Folacin (Folic Acid)

Physiologic Significance. Folic acid was first recognized as a dietary

essential for chicks in 1938 and later was shown to be a requirement of other animals. It seemed to have a specific function in the formation of red blood cells. A deficiency was manifest by an anemia with lack of sufficient erythrocytes. Folic acid was first used clinically in 1945 by Spies, who showed it to be effective in the treatment of macrocytic anemias of pregnancy and sprue. More recently, two other factors have been identified which are closely related to folacin in function but far more potent. They are synthetic folinic acid and the citrovorum factor isolated from natural sources. These two substances are closely related and may prove to be identical. None of this group—folic acid, folinic acid or the citrovorum factor—is entirely effective in the treatment of typical pernicious anemia.

Food Sources. The presence of this group of factors in green leaves was the basis for the names folacin and folinic acid (folium, meaning leaf). The chemical name for folacin is pteroylglutamic acid, and folinic acid is a derivative of the same compound. In addition to their presence in green leaves, these factors are found in liver, yeast, meats and fish.

Vitamin B_{12}

Physiologic Significance. Ever since the discovery that liver was effective in the treatment of pernicious anemia research workers have been hunting for the active principle in liver. At first it seemed that folic acid was the answer, but it proved to be ineffective in relieving many of the symptoms of the disease. In 1948, a more active substance, B_{12}, isolated from liver, induced favorable blood responses in patients with true pernicious anemia.

Properties of Vitamin B_{12}. Vitamin B_{12} is a nitrogenous compound containing cobalt and phosphorus. Cobalt, long known as a trace element essential for some animals, never before had been found in a natural organic compound.

Vitamin B_{12} is remarkably potent. It has a biologic activity 11,000 times that of a standard liver concentrate commonly used in the treatment of pernicious anemia. Thus B_{12} appears to be one of the most potent biologically active substances known. It has been administered therapeutically in doses of from 6 to 150 mcg. Comparative effects with folic acid in other types of anemia require doses of from 20,000 to 50,000 mcg. Food sources other than liver have not been investigated.

Para-aminobenzoic Acid (PABA)

Para-aminobenzoic acid was first recognized as a vitamin in 1941. However, it had long been known as a simple chemical derivative of benzoic acid. A deficiency of this factor has resulted in the graying of hair of dark-colored rats and other animals. Some laboratories have reported an interference with normal pregnancy and lactation but not with growth.

Inositol

Inositol was first considered to be a vitamin in 1940, although it had been known for decades as a carbohydrate substance similar to glucose chemically and with a sweet taste.

A deficiency of inositol was noted first by poor growth and loss of hair

	A	D	E	K	C
Chemical name	(PROVITAMIN) CAROTENE	CALCIFEROL	TOCOPHEROL	MENADIONE	ASCORBIC ACID
Important food sources	Liver Egg yolk Butter, cream Green and yellow vegetables	Irradiated foods Butter Egg yolk Liver	Wheat germ Leafy vegetables Vegetable oils Egg yolk Legumes Nuts	Leafy vegetables Pork-liver fat Soybean oil and other vegetable oils	Citrus fruits Strawberries Cantaloupe Tomatoes Sweet peppers Cabbage Potatoes
Concentrates or pharmaceutical sources	Fish-liver oil	Fish-liver oil Viosterol	Wheat-germ oil	Synthetic	Synthetic
Stability to cooking, drying, light, etc.	Gradual destruction by exposure to air, heat and drying more rapid at high temperatures	Stable to heating, aging and storage Destroyed by excess ultraviolet irradiation	Stable to all methods of food processing Destroyed by rancidity and ultraviolet irradiation	Stable to heat, light and exposure to air Destroyed by strong acids, alkalis and ox. agents	Unstable to heat and oxidation, except in acids Destroyed by drying and aging
Function: Essential in	Maintaining function of epithelial cells, skin, mucous membranes, visual purple	Calcium and phosphorus absorption and metabolism	Maintaining function of reproductive and muscular tissues	Clotting of blood—necessary in formation of prothrombin	Formation of intercellular substance, cellular oxidation and reduction
Deficiency manifest as	Night blindness Glare blindness Rough, dry skin Dry mucous membranes	Rickets Soft bones Bowed legs Poor teeth Skeletal deformities	Sterility in males (rats) Resorption of fetus (females) Muscular dystrophy in rats and rabbits	Slow clotting time of blood Some hemorrhagic disease of newborn Lack of prothrombin	Scurvy Sore mouth Stiff joints Sore and bleeding gums Weak-walled capillaries
Adult human requirement	5,000 I. U.	Children and adolescents, 400 I. U.	Unknown	Unknown	70–75 mg.

Fractions of the Vitamin B Complex

Thiamine (B_1)	Riboflavin (B_2)	Niacin and Niacinamide	Pantothenic Acid	Pyridoxine (B_6)	Biotin, Folacin B_{12}, Inositol Choline, Paba
Pork Liver, meats of organs Whole grains Enriched products Nuts, legumes Potatoes	Liver, milk Meats, eggs Enriched bread Green, leafy vegetables	Liver, poultry Meat, fish Whole grains Enriched products Legumes Mushrooms	Liver Meats of organs Eggs, peanuts Legumes Mushrooms Salmon, whole grains	Pork Meats of organs Legumes, seeds Grains Potatoes Bananas	Liver Meats of organs Some in leafy vegetables
Yeast, wheat germ, extracts Synthetic	Yeast Liver concentrates Synthetic	Yeast Liver concentrates Synthetic	Yeast, wheat germ, liver concentrates	Yeast, wheat germ, liver concentrates	Yeast concentrates
Unstable to heat and oxidation	Stable to heat in cooking, to acids and oxidation Unstable to light	Stable to heat, light and oxidation, acid and alkali	Unstable to acid, alkali, heat and certain salts	Stable to heat, light and oxidation	Variable stability to heat, light, acid and alkali
Carbohydrate metabolism, component of tissue enzyme cocarboxylase	Carbohydrate & amino acid metabolism, component of enzyme system	Carbohydrate & amino acid metabolism, component of enzyme system	Growth and health of all animals. Function unknown	Metabolism of fats and amino acids	Growth, cell respiration, blood formation, fat metabolism
Beriberi (man) Polyneuritis (animals) Poor appetite Fatigue Constipation	Eye sensitivity Cataract Cheilosis (man) Alopecia (rats)	Pellagra (man) Blacktongue (dogs)	Dermatitis (chicks) Graying of hair (rats)	Acrodynia (rats) Microcytic anemia (dogs)	Stunted growth and/or metabolic disturbances
Men 1.2-1.8 mg. Women 1.0-1.5 mg.	Men 1.8 mg. Women 1.5 mg.	Men 12-18 mg. Women 10-15 mg.	Unknown	Unknown	Unknown

in experimental mice. Various workers have suggested interrelationships with biotin, pantothenic acid, para-aminobenzoic acid, vitamin E and some of the unsaturated fatty acids. The biochemical function seems to be related in some way to fat metabolism and the prevention of lipoid deposits. The significance of inositol in human nutrition has not been established.

Food sources of inositol are fruits, vegetables, whole grain and organ meats. It occurs in plants as a phytin derivative, an organic phosphorus compound found in grains.

Choline

Choline has been known for decades as an essential component of animal tissues, but only recently has it been considered as a vitamin and classed with the B complex. This classification is still questioned by several workers. A choline deficiency may result in liver damage "fatty liver." Its action in the prevention of fatty livers is known as lipotropic. Its function seems to be associated closely with other members of the B complex, and without it normal conversion of carotene to vitamin A and storage in the liver are inhibited. Choline is distributed widely in plant and animal tissues, and a deficiency is not likely in the average diet.

OTHER VITAMINS

Six or seven other fractions of the B complex, have been described as essential for growth or protection against specific lesions in experimental animals, but as yet they have not been accepted generally. Nothing is known of their human significance. If an adequate intake of the better-known B complex vitamins is derived from natural sources, it can be assumed that those less well known are apt to be present. The confusion that accompanies the discovery of most new vitamins until their identity has been well established need not concern the average reader of this text.

Vitamin P or citrin is a term applied to a group of substances which have a function similar to that of ascorbic acid. They seem to be necessary for the integrity of capillary structure and permeability. They differ from ascorbic acid in being yellow plant pigments and relatively stable. They are present in the rind of citrus fruits (hence the name citrin), and they are also present in other fruits and green leaves.

ANTIVITAMINS AND VITAMIN ANTAGONISTS

Research on the chemical structure of the vitamins has led logically to knowledge of their characteristic reactions. In many instances a change in chemical composition, such as oxidation, completely destroys the vitamin activity. In other instances another compound may react with a vitamin in such a way as to inactivate it without actually destroying it. Such a substance is sometimes called an antivitamin. One example of an antivitamin is avidin, found in raw egg white. Avidin reacts with biotin to form a compound which cannot be absorbed from the intestinal tract. When experimental animals are fed raw egg white, a biotin deficiency develops. Another type of antivitamin is a compound so similar to the vitamin in structure that it starts to react as does the vitamin but can-

not finish the reaction. Thus the function which the vitamin is meant to perform cannot be accomplished.

Antibiotics and, possibly, some of the sulfa drugs used in the treatment of infections may be vitamin antagonists. Normally, bacteria in the intestinal tract have the ability to synthesize certain vitamins. When a sulfa drug or an antibiotic (a substance which destroys micro-organisms) is given orally, it may kill in the intestinal tract some of the bacteria capable of vitamin synthesis. Quite the opposite effect has been noted in some experiments on animals; in them, the antibiotics stimulate growth, possibly by destroying detrimental bacteria.

STUDY QUESTIONS

1. Give some of the events and names which are of interest in the history of vitamin discoveries.

2. What is the derivation of the word vitamin?

3. Which are the fat-soluble vitamins? Give the function and at least two good food sources for each.

4. What are the water-soluble vitamins? Give the function and at least two good food sources for each.

5. What vitamins are affected by heat? Which are lost to some extent in the cooking water?

6. Name three foods which have vitamins added by "enrichment." What factors are added to "enriched" flour or bread?

7. What is meant by subclinical deficiency? Are deficiency diseases common in the United States?

8. If a clinical condition in man is similar to an experimental deficiency in an animal, how can it be proved that the human condition is nutritional?

9. If a group of explorers were short of foods providing vitamins A, C and D, which deficiency might be expected to show up first?

10. Does the depth of yellow color in butter and in eggs indicate the vitamin A potency? Why or why not?

11. There are at least 12 fractions of the vitamin B complex recognized at present. If a new factor is discovered, what determines whether or not it belongs to this "family" of vitamins?

12. What vitamins are likely to be destroyed under the following conditions? (A) Milk exposed to sunlight. (B) Cabbage kept overnight after shredding. (C) Wheat germ allowed to become rancid. (D) Vegetables to which soda has been added in cooking. (E) Potatoes mashed and reheated.

13. Since the supply of vitamin D is limited in natural foods, commercial processing is producing vitamin D foods. How is this accomplished and what foods are commonly fortified with vitamin D?

14. When may a deficiency of vitamin K occur, and what prophylactic measures are recommended?

15. What is meant by an antivitamin and how may antivitamins act?

16. Using the basic dietary pattern as outlined in Chapter 1, calculate the contribution made by each of the food groups toward the day's requirement for each of the following vitamins: Vitamin A, thiamine, riboflavin, niacin and ascorbic acid.

CHAPTER EIGHT

Digestion, Absorption and Cell Metabolism

ENZYME ACTION IN DIGESTION
FOOD CHANGES IN THE MOUTH
DIGESTION IN THE STOMACH
HOW FOODS LEAVE THE STOMACH
DIGESTION IN THE SMALL INTESTINE
SUMMARY OF DIGESTIVE JUICES AND THEIR ENZYMES
ABSORPTION OF FOOD
FOOD CHANGES IN THE LARGE INTESTINE
FACTORS AFFECTING DIGESTION
INTERMEDIARY AND CELL METABOLISM
TRANSPORT AND STORAGE OF NUTRIENTS
WATER IN RELATION TO BODY FUNCTION
CELL METABOLISM

Digestion and absorption often are regarded as part of the total metabolism of food in the body. While this phase of the subject already may be familiar, a brief review of digestion cannot well be omitted from a study of nutrition.

ENZYME ACTION IN DIGESTION

Digestion is the process whereby foods are prepared by the various parts of the alimentary canal for absorption into the body proper. No food can function in nourishing the body tissues until it has been absorbed into the blood stream. Before food can be absorbed it must undergo a series of mechanical and chemical changes that constitute digestion. The chemical changes are brought about by a series of enzymes secreted by various glands in or near the digestive tract. These enzymes are capable of accelerating the breakdown of complex foodstuffs into simpler compounds. Enzyme action is specific; that is, a particular enzyme functions in the breakdown of a particular class of foodstuffs and has no action on any other. Digestion experiments performed outside the body, although not exactly duplicating body conditions, have served to demonstrate the high degree of specificity as well as the great activity of enzymes.

Enzymes may digest from 500,000 to 4,000,000 times their own weight of the foodstuffs in question. The enzymes are unstable at high temperatures. Most of them function best at body temperature and under the specific conditions provided in

given regions of the normal digestive tract. Enzymes are named most appropriately to indicate the substances upon which they act, using the ending -ase: for example, amylases (amyl, starch), proteases (protein) and lipases (lipid, fat). Specific enzymes act on each sugar—maltase on maltose, sucrase on sucrose, etc.

FOOD CHANGES IN THE MOUTH

The first change in food takes place in the mouth, where it is finely divided through the process of mastication, softened, moistened and made ready for swallowing. It is moistened by becoming mixed with saliva, a fluid secreted by three pairs of glands: the submaxillary, located near the angle of the jaw; the sublingual, beneath the tongue; and the parotid, in the cheek. It has been estimated that these glands secrete about 1,500 cc. of saliva per day, a little more than three pints. The most active principle of the saliva is a salivary amylase—ptyalin—an enzyme that acts on starch. Ptyalin carries the digestion of the cooked starch through three or more dextrin stages down to the sugar, maltose. The possibility that maltose may be changed to glucose by a salivary maltase has been suggested by some workers. However, the complete change of starch to either maltose or glucose seldom occurs in the mouth, since food remains there only a few minutes.

Swallowing is a reflex act initiated by the muscles at the base of the tongue. The bolus of food is carried down the esophagus partly by gravity and partly by muscular action—a wave of relaxation followed by a wave of constriction (peristalsis), the entire process taking only a few seconds.

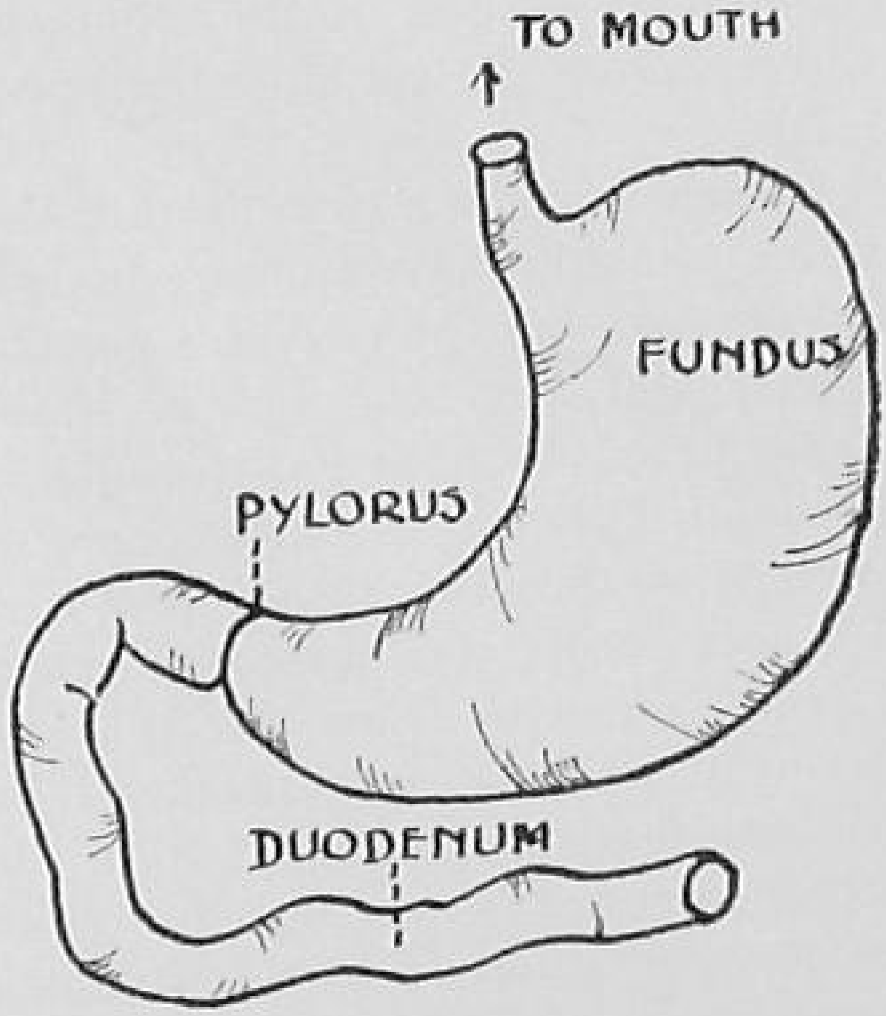


Fig. 26. Stomach showing fundus where food is first held. Note the pylorus at the entrance to the duodenum.

DIGESTION IN THE STOMACH

As the food enters the stomach it forms a mass in the fundus, the portion nearest the esophagus that serves as a reservoir for food. Here it is held for some time, variously estimated at from one half to two hours, during which time little or no free hydrochloric acid mixes with it. The glands producing the acid are situated in the middle portion of the stomach. The salivary digestion of starch proceeds until such time as the food mass, which is neutral or slightly alkaline upon entering the stomach, has become permeated with the acid gastric juice. The food mass in the fundus is reduced gradually in size as small portions move toward

the middle portion of the stomach, where active gastric digestion proceeds.

Gastric juice is a clear liquid, the active principles of which are hydrochloric acid and the enzymes pepsin, rennin and a gastric lipase. From 2,000 to 2,500 cc. of gastric juice is secreted daily. Hydrochloric acid is present in the juice in about 0.4 or 0.5 per cent concentration when freshly secreted from the glands. Some of the acid is neutralized by alkaline fluids regurgitated from the small intestine. Therefore, the juice as it is obtained from the stomach contains about 0.2 per cent hydrochloric acid, which is diluted still further when food is present. In abnormal conditions the acid may be increased, reduced or absent. The acid probably serves to delay or inhibit the growth of some of the micro-organisms that find entrance into the stomach along with the water and the food. This inhibiting value must not be overemphasized, because it is limited by the short time the food is in contact with the acid.

Gastric Enzymes. The gastric protease—pepsin—is formed by the action of hydrochloric acid on the inactive form of the enzyme known as pepsinogen. Pepsin changes proteins into the simpler forms, proteoses and peptones. This peptic action is continued for a short time after the food reaches the intestinal tract. Rarely, if ever, is the quantity of pepsin insufficient for the digestion of the proteins, but the amount of hydrochloric acid secreted may be insufficient to activate the pepsinogen.

Rennin, another enzyme of the gastric juice, brings about the curdling of milk (Anglo-saxon, gerinnen, to curdle). It is a coagulating enzyme that acts upon the casein, one of the protein constituents of milk, preparing it for the further action of the protein-splitting enzymes in the intestine.

A gastric lipase, the presence of which formerly was questioned, may split the emulsified fats, such as are found in cream and in egg yolk, to fatty acids and glycerol.

How Foods Leave the Stomach

Peristaltic waves, the rhythmic contractions of the alimentary tract, which originate at the transverse band near the middle of the stomach, carry the food on toward the pylorus, which in turn finally permits it to pass on into the intestinal tract. Water leaves the stomach rapidly, in one half hour or less, partly through a relaxed pylorus and partly by absorption directly from the stomach into the blood stream. Foods leave more slowly, the emptying time of the stomach varying with the individual and with the amount and the nature of the meal. Small amounts of food may leave the stomach in from one to four hours, while the last remnant of a full-sized meal may not have disappeared in six or seven hours. Carbohydrates taken alone leave the stomach more rapidly than protein, and protein more rapidly than fat alone, but mixtures apparently leave more slowly than their single food constituents.

The Pylorus. When the food has become thoroughly mixed with the gastric juice, the pylorus, a strong sphincter muscle—gatekeeper of the stomach—opens more frequently, and

the walls of the stomach contract more vigorously so as to force the semifluid food material out into the duodenum. This material is known as chyme. The presence of acid in it causes the intestinal mucous membrane to secrete into the blood stream a substance called secretin, which in turn stimulates an outpouring of the pancreatic juice into the duodenum.

DIGESTION IN THE SMALL INTESTINE

Intestinal Juices. In the small intestine the food is mixed with other digestive juices, which are capable of acting upon all three of the principal food constituents, namely, carbohydrates, fats and proteins. The pancreatic juice, secreted by the pancreas, and the bile, secreted by the liver, are poured into the duodenum, a short distance beyond the pylorus. The intestinal juice or succus entericus is secreted by glands in the walls of the small intestines. All three juices—the pancreatic, the bile and the intestinal—act in unison upon the chyme. They are all alkaline and their first action is to neutralize the hydrochloric acid and other acids of the food mass.

Pancreatic Enzymes in the Intestines. The enzymes in the pancreatic juice include a protease (trypsin), an amylase (amylopsin), a lipase (steapsin) and maltase. Trypsin, activated by the intestinal juice, continues the digestion of proteoses and peptones or initiates the breakdown of proteins that may have escaped peptic digestion in the stomach. Trypsin is the most powerful proteolytic enzyme and may carry the splitting process to the amino-acid stage.

Amylopsin from the pancreas continues the digestion of any starches that may not have been carried to the maltose stage by the action of ptyalin in the saliva. Even raw starches may be digested by this enzyme. The pancreatic maltase acts on maltose, changing it into glucose.

Fats must be emulsified first into microscopic globules before they can be digested or absorbed. The bile salts in the bile are chiefly responsible for this emulsifying action, which greatly increases the surface area of the fats exposed to enzyme action. The steapsin then may split a large portion of the fat to fatty acid and glycerol. The undigested portion of the emulsified fat may be changed into more soluble form by the action of the bile salts. Thus the bile is essential for both the digestion and the absorption of fats and the fat-soluble vitamins.

Intestinal Enzymes. The intestinal juice contains a protease enzyme—erepsin—that carries the hydrolysis of partially digested protein to completion, breaking proteoses and peptones to amino acids. The intestinal juice completes the digestion of the carbohydrates by means of the three specific enzymes—sucrase, maltase and lactase—that split respectively sucrose (cane sugar), maltose and lactose (milk sugar) into the single sugars (glucose, fructose and galactose).

The table on page 115 shows the action of the various digestive juices upon the food constituents.

The diagram of the digestive organs should be studied along with the table on the following page.

ABSORPTION OF FOOD

With the exception of a small

STOMACH EVACUATION TIMES AND HIGHEST TOTAL ACIDITIES FOR VARIOUS ARTICLES OF DIET[1]

ARTICLE OF DIET 100-gram portions unless otherwise stated	NUMBER OF OBSERVATIONS	HIGHEST TOTAL ACIDITY (average) (cc. 0.1 N alkali to neutralize 100 cc. juice)	EVACUATION TIME HOURS AND MINUTES (average)
Beef and beef products	25	120	3.00
Bread and cereals	75	80	2.40
Cakes	29	90	3.00
Chicken	20	125	3.15
Egg and egg combinations	90	80	2.40
Fish	75	130	2.50
Fruits	68	90	2.00
Gelatin (fruit-juice preparations)	5	70	2.00
Guinea hen	2	110	4.00
Ice Cream	7	105	3.15
Ices	4	65	2.35
Junket	4	65	2.25
Lamb and lamb products	14	135	3.00
Licorice	1	65	3.00
Milk:			
Cow:			
400 cc.	50	100	2.30
75 cc.	3	45	1.15
Human:			
150 cc.	5	60	1.40
225 cc.	2	90	2.25
Nuts (25 to 50 grams)	22	100	3.30
Orange-albumen (2:1)	2	85	2.20
Pies	29	90	2.30
Popcorn	3	60	1.30
Pork and pork products	31	120	3.15
Puddings	23	90	2.20
Sugars and candies	28	70	2.05
Turkey	2	140	3.30
Veal:			
(A) Market	7	140	2.50
(B) "Bob"	7	110	3.20
Vegetables prepared in different ways	124	75	2.15

[1] Hawk & Bergeim: Practical Physiological Chemistry, Blakiston, Philadelphia, 1937.

amount of water, no absorption of food takes place from the mouth and almost none from the stomach. By far the greater portion of the food material is absorbed from the small intestine. The absorbing surface of the small intestine is greatly increased by numerous fingerlike projections or processes called villi, which extend into the food mass. Each tiny villus is provided with numerous capillaries, an artery and a vein, and in the center is a lymph space called a lacteal or chyle vessel, which is a part of the lymphatic system (Fig. 27). Each villus has a muscular structure that permits expansion and contraction. Digested food material is absorbed through the walls of the villi into the blood or the lymph capillaries and then forced on into the larger blood and lymph vessels of the intestinal wall.

Selective Absorption. The products of protein digestion, amino acids, together with the single sugars, pass through the walls of the villi into the minute blood vessels, which in turn carry these absorption products into the portal vein and thence to the liver.

Products of fat digestion may follow either of two pathways. The fatty acids and glycerol probably reunite during passage through the intestinal villi, and the neutral fat thus formed may be absorbed by either the lacteals or the blood capillaries. The finely emulsified fat which is not split by enzyme action must be absorbed via the lacteals. The lymph carries these products via the thoracic duct, thence slowly into the blood stream in the left subclavian vein. The portal blood carries its absorbed products to the liver for redistribution through the systemic circulation.

Passage of the food along the intestinal tract proceeds with regularity and rhythm. The acid chyme first ejected through the pylorus remains in the duodenum until there have been similar additions of food material. Segmentation of the food mass is then brought about by contractions of nonconsecutive rings of muscle at different portions of the intestinal tract. These contractions take place first at one point and then at another, thus bringing about a thorough mixing of the food with the digestive juices and aiding in absorption. Contraction and segmentation cease periodically and the small masses of food material are carried forward by peristalsis. The food again masses together, accumulating in the lower portion of the small intestine, the ileum. Here remnants of undigested foods are allowed longer contact with the digestive juices, digestion being practically completed at this point. What remains of the fluid mass is then passed on into the large intestine.

The Ileocecal Valve. Between the small and the large intestine there is another gate, similar in function to the pylorus of the stomach, known as the ileocecal valve. The food mass passes through the ileocecal valve into the large intestine, where further absorption of fluid may take place. If this valve is unimpaired, it rarely allows any of the food mass to pass back again into the small intestine, in spite of antiperistalsis in the cecum. Antiperistalsis, a reverse movement, as well as peristalsis, takes place in the anterior portion of the large intestine. This

antiperistaltic movement permits the food to come into close contact with the walls of the large intestine, thus favoring absorption of water.

FOOD CHANGES IN THE LARGE INTESTINE

The large intestine does not secrete any enzymes, although digestion continues here, as salivary digestion continues in the stomach due to digestive juices already mixed with the food. The large intestine fills rather slowly, and in it the food mass remains for several hours,

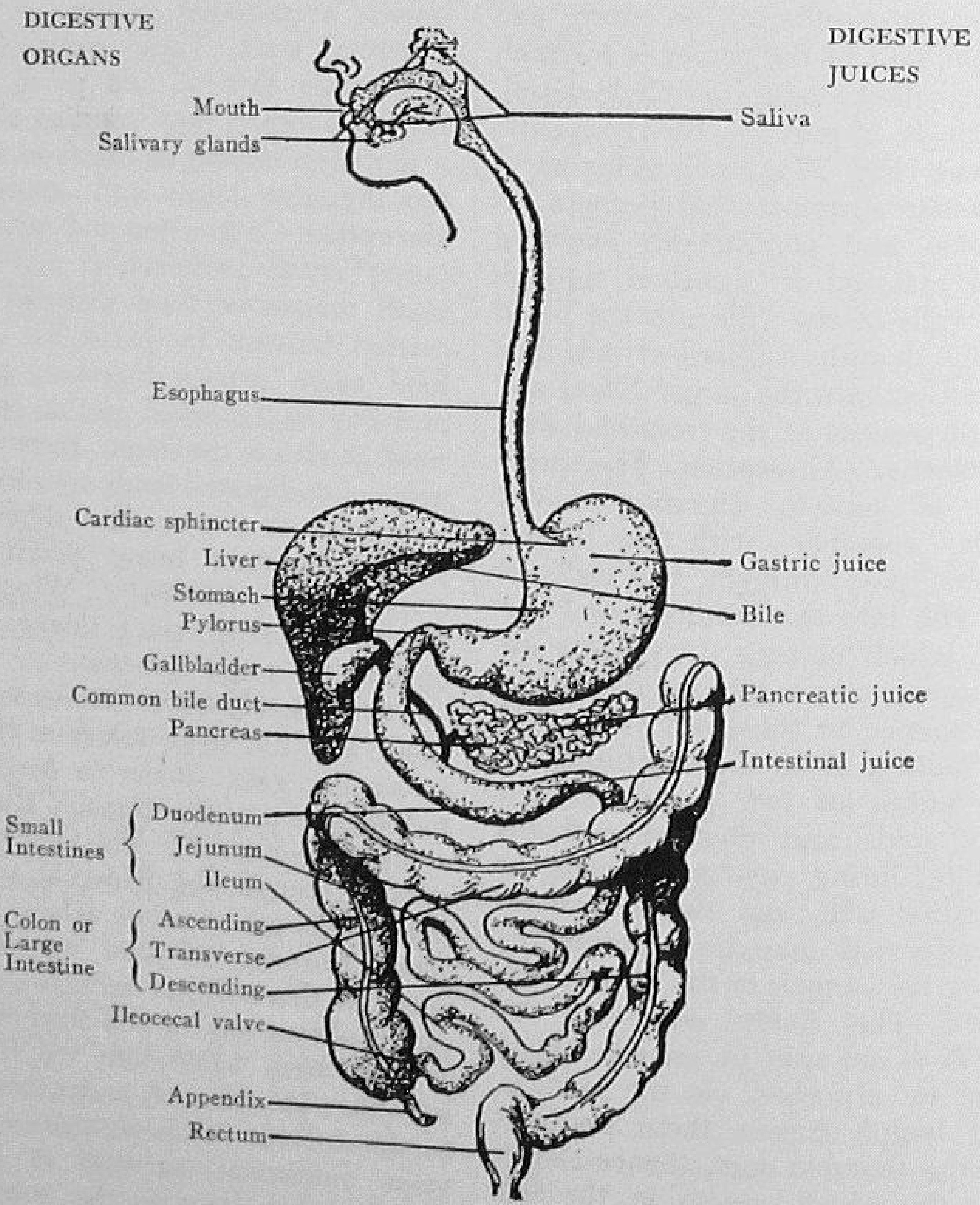


FIG. 27. Diagram of digestive organs and juices, etc.

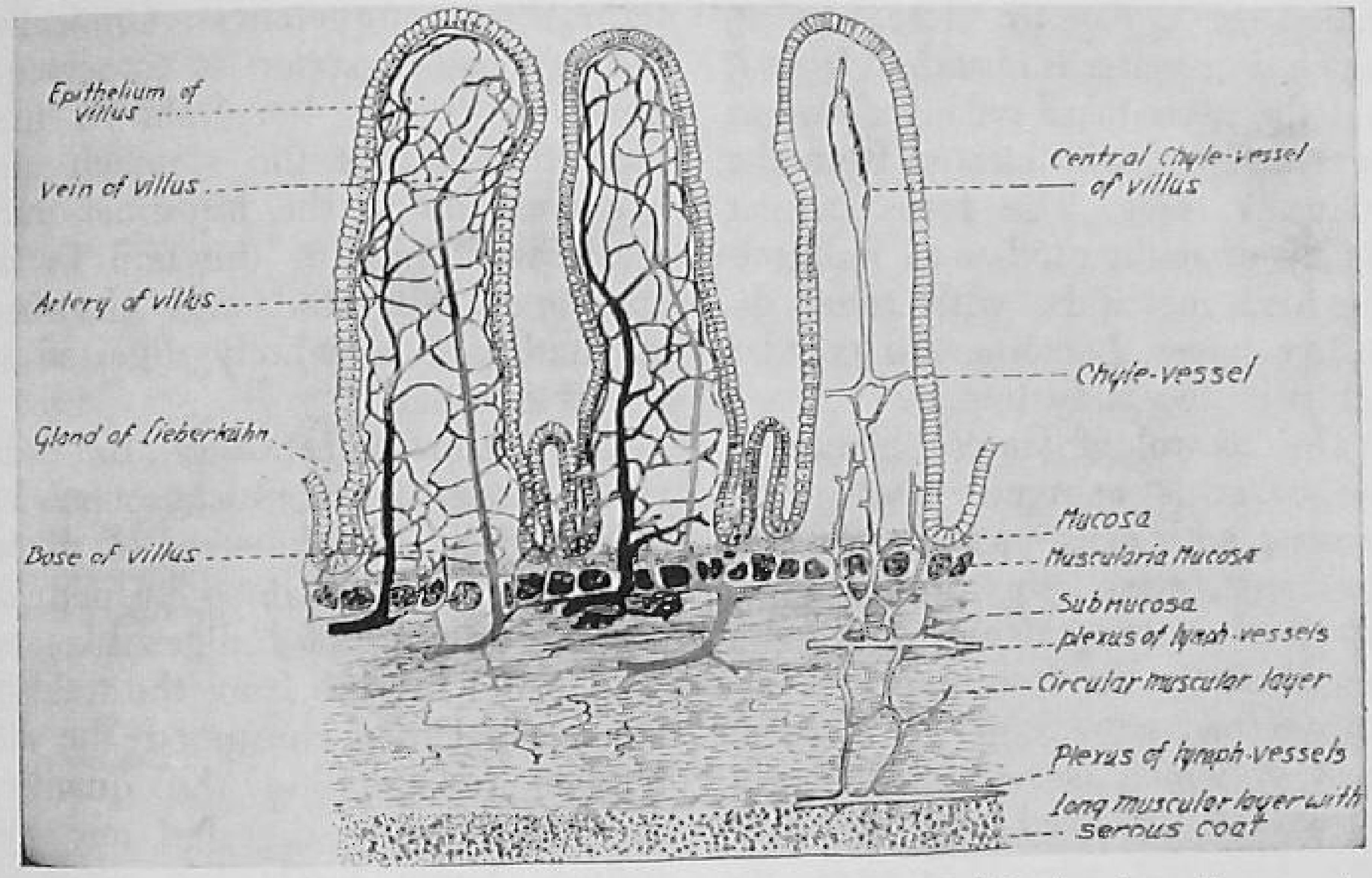


Fig. 28. Diagrammatic drawing (after F. P. Mall) showing the great extension of absorbing surface of the intestinal lining due to projecting villi.

Summary of Digestive Juices and Their Enzymes

(See diagram on opposite page.)

Digestive Juice	Enzymes Present	Reactions Promoted
Salivary	Amylase (ptyalin)	Starch → maltose
Gastric	Protease (pepsin) Lipase Rennin Hydrochloric acid (not an enzyme)	Protein → proteoses and peptones Emulsified fats → fatty acids and glycerol Aids in the digestion of milk (casein) Activates pepsinogen
Pancreatic	Amylase (amylopsin) Protease (trypsin) Lipase (steapsin) Maltase	Starch → maltose Protein → amino acids and intermediate products Fats → fatty acids and glycerol Maltose → glucose
Intestinal	Protease (erepsin) Disaccharidase { sucrase, maltase, lactase }	Proteoses → amino acids and ammonia Sucrose (cane sugar) → glucose and fructose Maltose → glucose (2 molecules) Lactose → glucose and galactose
Bile	....	Aids in digestion and absorption of fats by emulsification

sometimes a day or more, during which time water is absorbed from it and the mass takes on more or less form and is finally ejected from the body as feces. The feces consist chiefly of undigested- and indigestible-food materials, with some digestive juices, bacteria and cellular debris of the body tissues.

The control of water balance in the colon is extremely important, because both constipation and diarrhea are essentially problems of disturbed water balance. During a day there is secreted into the digestive tract some 8,500 cc. of fluid, most of which is reabsorbed as a carrier of dissolved-food constituents. Complex osmotic-pressure relations determine how much is absorbed and how much left with the intestinal residue. Numerous environmental and psychic factors may interfere with the optimum amount of water being retained for normal stool formation and evacuation. According to Gauss[2] it is one function of the bile to control the amount of water in the colon contents. Whatever the controlling mechanism may be, there is much yet to be learned about the functioning of the colon and the process of defecation.

FACTORS AFFECTING DIGESTION

Digestibility, as the word is ordinarily used by physicians and nurses as well as the general public, has reference to the ease or the rapidity rather than to the completeness of digestion. Ease of digestion is a much more indefinite term than completeness. Clinically, the rate of digestion is important; however, it has been shown that food that leaves the stomach and is passed on to the intestinal tract undigested may in the end be as completely digested and absorbed as food that is wholly digested in a shorter time.

The term digestibility, as ordinarily used by scientists, refers to the possible completeness of digestion. This is determined by deducting the amount of indigestible and undigested residue from the total of the original food consumed, the difference representing the quantity of food actually digested and absorbed. Some foods—for example, sugar—may be completely digested, but most foods leave some residue. It was found by Atwater, and later by other scientists, that more than 90 per cent of the food of a mixed diet is actually utilized.

Ease of digestion is affected by a number of conditions, among which are the psychologic factors, such as anger and fear, which may greatly retard digestion. On the other hand, joy and mirth are conducive to more normal digestion. The kind of food and the method of preparation also may affect this condition. Food to which one is unaccustomed, particularly if it is unattractive, is often digested with difficulty. Thus, even when food is scarce and people are hungry, unfamiliar foods are not accepted readily.

The fineness of division of food in another factor that favors ease of digestion. The fineness of division may be brought about by mechanical means during preparation by mashing the food, or by forcing it

[2] Gauss, Harry: Am. J. Digest. Dis. 12:224, 1945.

AVERAGE COEFFICIENTS OF DIGESTIBILITY OF FOODS WHEN USED IN MIXED DIET (CELLULOSE CONTENT NOT INCLUDED)

	PROTEIN per cent	FAT per cent	CARBOHYDRATE per cent
Animal foods....	97	95	98
Cereals and breadstuffs....	85	90	98
Dried legumes...	78	90	97
Vegetables......	83	90	95
Fruits..........	85	90	90
Total food of average mixed diet..........	92	95	98

through a sieve or a strainer, or, when eating, by thorough mastication. In case of illness, foods may be given in forms that are more readily digested, such as gruels, purees or soups. Liquid foods are absorbed more quickly than more solid ones, chiefly because the digestive juices come in contact more quickly with the whole of the substances to be digested. The total quantity of food material taken at one time is also significant. For this reason it is imperative that persons suffering from acute illness should be fed small amounts at frequent intervals, rather than large amounts at regular meal hours.

Intestinal motility, the vigor of the peristalic muscular action, determines the speed with which food masses and residue are moved along the alimentary canal. This motility may be excessive when there is inflammation or infection, and the result is diarrhea. Constipation may result from sluggish motility, which condition may be due to poor muscle tone. Vitamin B complex and a reasonable amount of bulk tend to promote normal motility.

Cellulose in all vegetable foods slows digestion, particularly of the proteins. It has been demonstrated that dry legumes (peas, beans and lentils) have coefficients of protein digestibility of 78 per cent, but when free of cellulose their coefficient of digestibility for protein is about as high as for animal foods, 97 per cent. However, a limited amount of cellulose is advantageous, because of its laxative action in the colon. The cellulose in foods, given as fiber in most food tables, is discussed more fully in Chapter 2, and its use in intestinal diseases is considered in Chapter 24.

The above table shows the completeness of digestion of various classes of foods as determined by Atwater.[3]

INTERMEDIARY AND CELL METABOLISM

A study of digestion and absorption of foods would not be complete without some mention of the fate of the absorbed nutrients. The transport of the nutrients by the blood stream, the storage of surplus nutrients, metabolism in the cells and the role played by water in the body are all part of the picture. Each of these subjects warrants more study than the brief comments possible here.

[3] Atwater, W. O.: Farmers' Bulletin No. 142, U. S. Department of Agriculture, 1902.

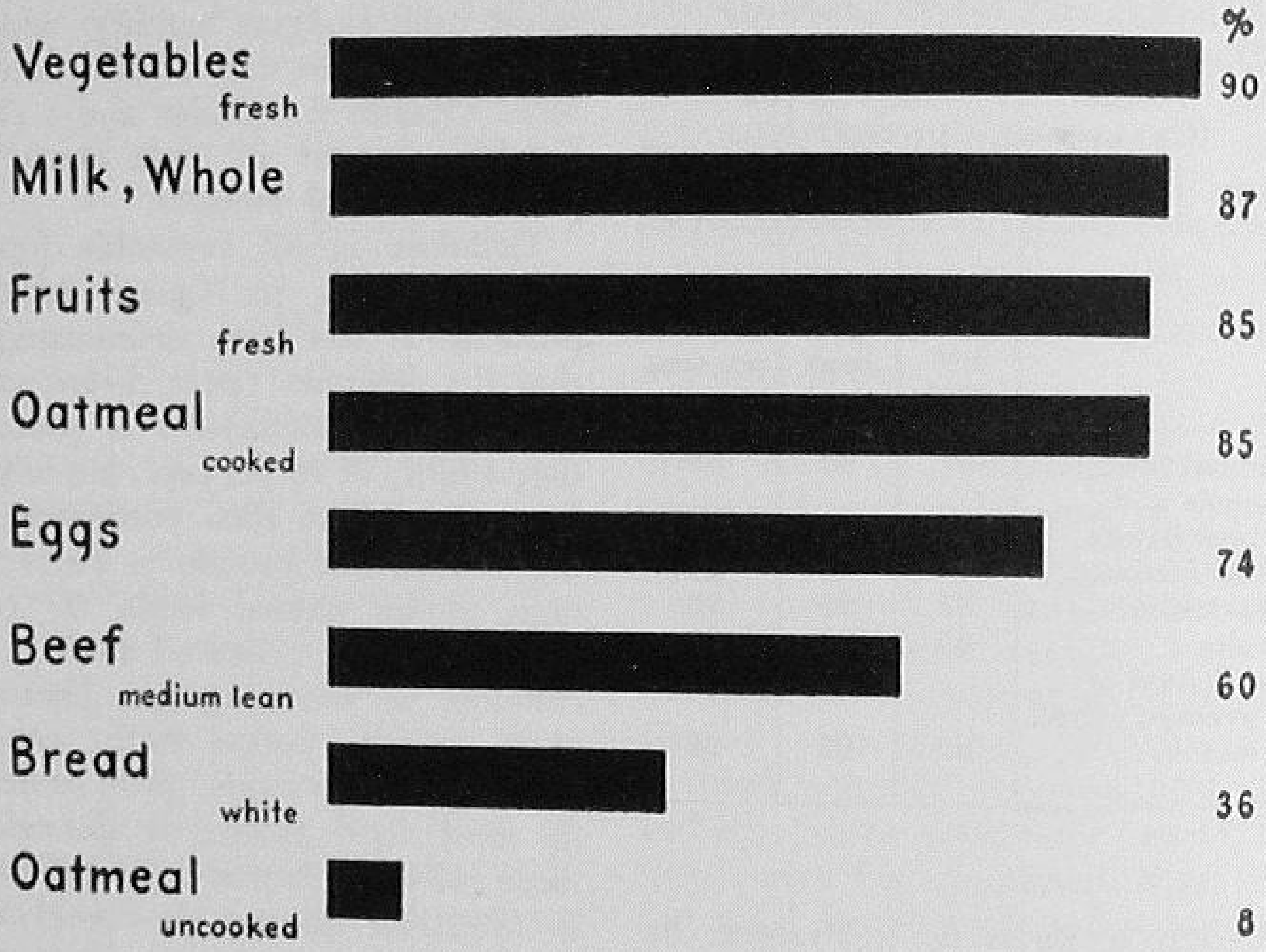


Fig. 29. Percentage of water in common foods.

Transport and Storage of Nutrients

All of the absorbed nutrients are carried to the tissues by the blood stream. All excess nutrients and end-products of metabolism are carried from the tissues by the blood.

The liver and the muscles store part of the sugar as glycogen, and another part may be changed to fat and along with excess fat be stored in the body as adipose tissue. Amino acids, the end-products of protein digestion, are allowed to proceed to the tissues where needed. If they are in excess of the needs of the tissues for building or repairs, they are split into two parts. One portion contains nitrogen, most of which is excreted as urea; the other portion, some of which is similar to carbohydrate, is utilized as such. The metabolism of each food constituent has been discussed in more detail in the respective Chapters.

Water in Relation to Body Function

Water is not changed in any way by the digestive juices but it is a necessary constituent of them and of every cell in the body. Water is even more essential to life than food. Man may live weeks without food, but only days without water. Two-thirds of the body weight is water. About four and a half pints is eliminated every day, carrying waste material with it. This amount must be replaced in form of fluids or foods containing water.

Although some water (about $\frac{2}{3}$

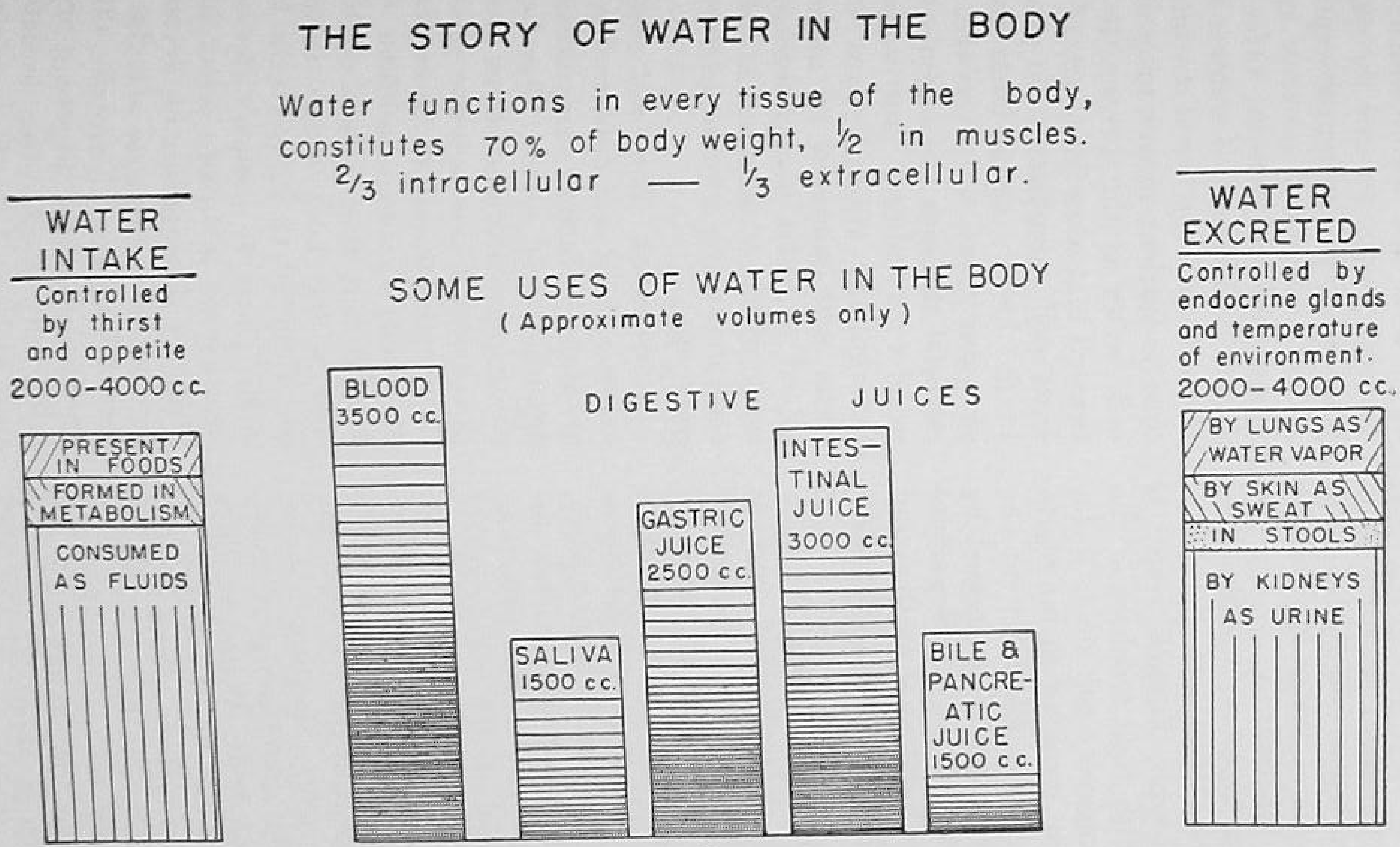

THE STORY OF WATER IN THE BODY
Water functions in every tissue of the body, constitutes 70% of body weight, 1/2 in muscles.
2/3 intracellular — 1/3 extracellular.
WATER INTAKE
Controlled by thirst and appetite
2000-4000 cc.
PRESENT IN FOODS
FORMED IN METABOLISM
CONSUMED AS FLUIDS
SOME USES OF WATER IN THE BODY
(Approximate volumes only)
DIGESTIVE JUICES
BLOOD 3500 cc.
SALIVA 1500 cc.
GASTRIC JUICE 2500 cc.
INTES-TINAL JUICE 3000 cc.
BILE & PANCRE-ATIC JUICE 1500 cc.
WATER EXCRETED
Controlled by endocrine glands and temperature of environment.
2000-4000 cc.
BY LUNGS AS WATER VAPOR
BY SKIN AS SWEAT
IN STOOLS
BY KIDNEYS AS URINE

FIGURE 30

pint) is formed within the body as an end-product of food metabolism, from six to eight glasses of water or beverages should be drunk daily in order to make sure that a sufficient amount of water is available for bodily functions.

Water is absorbed rapidly from the digestive tract into the blood and the lymph. Enough water is retained with food residues in the colon to produce a soft stool. Water taken before breakfast in the morning may act as a mild laxative. The laxative effect may be increased by taking water plus a small amount of salt, which delays absorption and tends to retain the water in the intestine.

Water in Body Fluids. Water is essential as a component part of blood, lymph and the secretions of the body, as well as of the more solid tissues. Water is the universal medium in which the various chemical changes of the body take place. As a carrier it aids in digestion, absorption, circulation and excretion; it is essential in the regulation of body temperature; it plays an important part in the mechanical functions, such as lubrication of joints and movement of the viscera in the abdominal cavity. Moisture is necessary for the functioning of every organ in the body. Waste products from the tissues are transferred to the blood in watery solutions; they are carried by the blood, which is about 90 per cent water; they are excreted via the kidneys in the urine, which is about 97 per cent water (Fig. 30).

The same water is reutilized many times and for different purposes. Approximately 8 to 9 quarts (8,500 cc.) of digestive juices are produced and secreted by glands in 24 hours (Fig. 27). The water which carries the active enzymes into the digestive tract is used during absorption to carry the digested nutrients into the blood and the lymph. Over three quarts (3,500 cc.) of water is always circulating in the blood stream. Each time a nutrient moves to or from a cell, water is the carrier. It is estimated that some 50 quarts of water cross cell membranes in one day. In the kidney again large volumes of water carry the dissolved waste material through the capsule of the uriniferous tubules, but in passing through the tubules most of the water with some of its useful dissolved material is reabsorbed. The urine which is excreted is the concentrated water solution of the waste products.

Dehydration. The fatal results of extreme thirst and dehydration (loss of water) further emphasize the importance of water. The German physiologist Rubner states that we can lose all our reserve glycogen, all reserve fat and about one half of the body protein without great danger, but that a loss of 10 per cent of the body water is serious and from 20 to 22 per cent loss is fatal. Thirst is nature's device for ensuring an adequate water intake. Thirst is a sensation of dryness at the root of the tongue and the back part of the throat. Normally, thirst is experienced when breathing dry air, eating dry food, after exercise or after prolonged speaking or singing. Any circumstance that tends to increase water elimination, such as profuse sweating, hemorrhage, diarrhea or increased volume of urine,

as in diabetes, will create intense thirst. The use of common salt to stimulate thirst and increase water consumption has already been discussed in Chapter 6.

Cell Metabolism

The metabolic processes within the cells might be said to resemble digestion since they are a series of enzyme reactions. Actually, alimentary digestion, complex as it may seem, is simple compared with the complex activities in the tissue cells. Nature provides for synthesis of specific types of protoplasm for each cell, for storage and release of energy, for maintenance of blood constituents and for the elaboration of hormones and enzymes.

Cells cannot grow and multiply and perform their functions unless the necessary constituents are brought to them at all times. The cell is the vital unit of the body, and all these myriads of cell units work together as an organized whole. The cells may be compared with one-celled animals, but instead of every cell in the body performing all the functions necessary for life, they have become specialized as to function in the higher animals, and every cell in the body is dependent upon many others for existence, i.e., for foods ready for use and for special substances such as hormones and growth substances. The cells may be compared with individuals in human society; each does its own job but depends upon others for existence.

The composition of the cells and the tissues of the body is remarkably constant, yet there is continual change or exchange of constituents. This is known as a state of dynamic equilibrium. Even the cells of such stable structures as teeth and bone are in a state of dynamic equilibrium. Conclusive proof of this has come from the use of tagged elements that could be incorporated in food fed to experimental animals and followed to their ultimate destination in the body tissues. Heavy hydrogen and heavy carbon have molecular weights one more than the usual elements and can be detected by suitable instruments even in living tissue. Physiologically, they behave the same as the regular elements as constituents of organic compounds in the body. Radioactive minerals, such as iron, calcium and phosphorus, have been used as tagged elements in the study of mineral metabolism and have verified the theory that mineral compounds, both in hard and in soft tissues, are in a constant state of change.

Thus for all cell metabolism it is obvious that the necessary materials must be available from the blood and the lymph and must be replenished continually from the digestive tract and from body stores. The demand will be greater during growth when new cells are forming and a gradual change in certain tissues is taking place. However, even after growth ceases, the adult organism must provide for constant replacement of cell constituents. The body is frugal indeed regarding the waste of essential materials and provides for their utilization again and again, as in the case of iron for hemoglobin. All these exchanges and resyntheses demand cellular activity and enzyme action. Thus the digestion of food in the alimentary

tract is only the first step in the chain of events that must take place before food becomes body tissue.

STUDY QUESTIONS

1. Draw a diagram of the digestive tract and state the function of each part.
2. Name the digestive enzymes, the site of production, the action of each and the end-products of digestion.
3. Digestive enzymes function best at body temperature. How would freezing or boiling temperatures affect enzyme action?
4. If you desired to demonstrate a proteolytic enzyme that would attack protein and break it all the way to amino acid, which would you choose?
5. If gastric digestion is slow or incomplete, would it be likely to be due to insufficient pepsin, rennin or hydrochloric acid?
6. Why would a diet of bread and vegetables create the sensation of hunger more than an equal number of calories with some protein and fat present?
7. Certain food faddists caution against eating starches and protein at the same meal. Is there any evidence from the way the digestive enzymes work that would refute this theory?
8. In a beverage containing milk, sucrose, glucose, salt, iron and vitamins, which factors would need digestion before absorption?
9. If the flow of bile is insufficient, which enzymatic action is most likely to be hindered?
10. If the cecum is full, will the resulting pressure on the valve tend to keep it open or closed? Explain your answer.
11. If water in the body is not sufficient for metabolic needs, what makes a person aware of this particular need?
12. Compare the rate of absorption of fats and sugars. How would this difference affect the rate at which these foodstuffs would reach the blood and the tissues?
13. What is meant by a state of dynamic equilibrium in the body? What new research device has helped to prove this theory?

CHAPTER NINE

Recommended Dietary Allowances

THE PROBLEM OF ESTIMATING HUMAN DIETARY NEEDS
FORMULATED RECOMMENDATIONS
DISCUSSION AND INTERPRETATION OF RECOMMENDED ALLOWANCES
SAMPLE MENUS—NUTRITIVE VALUE CALCULATED

In the application of the science of nutrition of everyday human needs the first step is for research experts to determine and define the goals of good nutrition—to make a yardstick by which to measure it. The second step is for nutritionists and dietitians to interpret these goals in terms of common foods—to show how to use the yardstick. This chapter is the story of the most successful attempt in the history of nutrition to do this job.

THE PROBLEM OF ESTIMATING HUMAN DIETARY NEEDS

The idea of setting up standards for planning family meals and food supplies is not new. The history of the development of dietary standards parallels in general the changing concepts of nutrition outlined briefly in Chapter 1. Some early estimates were based upon what people actually were eating, not upon what they needed.

Even after needs were recognized, many years had to elapse before methods were developed for quantitative assays. Even then the bulk of the research work was done on animals. Criteria also had to be developed for recognizing early deficiencies and distinguishing between minimum requirements and optimum allowances desirable. The student should appreciate the decades of labor by thousands of research workers that have made possible the present-day tables of dietary recommendations.

Beginning in 1933 some attempts were made to define human requirements for specific nutrients, first by the British Medical Association and later by Stiebeling and co-workers in the United States Department of Agriculture. The standards formulated by the League of Nations Health Committee in 1935 were the first to represent group opinion and were based on the limited information then available.

When the Food and Nutrition Board was appointed by the National Research Council in 1940, it undertook as one of its most important projects the formulation of a set of figures for human requirements in terms of specific nutrients. The National Nutrition Program

could not be undertaken without some such recognized goal for planning adequate diets. For this purpose it seemed desirable to state allowances that would be suitable for the maintenance of good nutrition for everyone, recognizing variation in requirements rather than minimum or average needs. Thus there is considerable margin between actual requirements for most nutrients and the desirable goals set by the National Research Council figures.

The Canadian and the British committees,[1] working at the same time but independent of the United States group, arrived at standards for human requirements that are somewhat lower than ours in several nutrients. The purposes and the philosophy of setting standards of this type may differ widely; also, the interpretations of scientific data may differ. Perhaps it is notable that they agree as closely as they do. It is doubtful whether any set of figures could serve all purposes. Students of the subject realize that any or all of these figures are subject to change as more scientific knowledge accumulates.

FORMULATED RECOMMENDATIONS

The table of Recommended Dietary Allowances was originally published in May, 1941, and was popularly called the Yardstick of Good Nutrition. It represented the combined and the seasoned judgments of nutrition authorities. The 1948 revision incorporates findings reported since 1941. The history of the way this table was formulated is worthy of note. The published evidence regarding human requirements for each nutrient to be considered was reviewed critically by a large number of nutrition authorities actively engaged in research. It was impossible—as it still is—to find scientific data for all age and sex catagories. The choice of nutrients listed was based upon the likelihood of deficiencies. Tentative allowances were formulated from the evidence assembled and again submitted to every contributor for criticism. Thus the values represented the consensus of the entire group. The same general policy has been followed in making subsequent revisions.

The table and the footnotes of the 1948 revision of the Recommended Dietary Allowances[2] are quoted in full in this chapter. This table should be used for reference and studied by comparing the allowances of a given nutrient for different age and sex categories. Much can be observed about the meaning of figures in a table such as this without learning the figures. One should know how to use an authoritative source such as this for reference.

In using the recommendations, it is important that the purposes and the general policies of the Board be understood. These purposes are explained more in detail in the original publication, with which every stu-

[1] Pett, L. B.: J. Am. Dietet. A. **27**:28, 1951.

[2] Recommended Dietary Allowances, National Research Council, Reprint and Circular Series No. 129, Washington, Oct., 1948.

dent of the subject should be familiar. The Board adopted the term "recommended allowances" rather than "standards" to avoid any implication of minimum requirements.

DISCUSSION AND INTERPRETATION OF RECOMMENDED ALLOWANCES

For proper and intelligent use of the recommended allowances the following explanation quoted from the original publication is essential:

The allowances for adults are given for a man of 70 kg. and a woman of 56 kg. They should be decreased or increased proportionately for smaller or larger persons within each named category. The allowances for children are given for age groups, and for boys and girls separately after 12 years because from about that age the growth curves and levels of activity differ significantly.

The allowances during the growth period as shown in the table may appear to have steplike changes from one age category to another because of their being tabulated by age groups. Obviously such abrupt changes in requirement cannot occur. A man lacking one day of being 21 years of age does not have a protein requirement which decreases overnight from 100 to 70 grams. Actually the allowances are stated for the middle of the age group and for average size and activity. They are different on each side of the middle. When the allowances that are given are plotted by age, a curve is obtained that permits interpolation for ages for which no values are given. The curve of values slopes gradually from those stated for 18 years to those for adults, beginning at 21 years. For most of the nutrients listed the values at 20 years are little different from those of 21. Since size is as important as age, if not more important, at different periods of development, probably a band rather than a line on a graph represents the truth more adequately.

The allowances are for persons in health. Needs vary greatly in disease. For example, in febrile conditions an increased need usually exists for calories, thiamine and ascorbic acid. The need for these and other constituents may be greatly altered in other diseases as well, especially those of the alimentary tract which interfere with absorption.

The values of the table are for content of foods as eaten and do not allow for losses in storage, cooking and serving. Because such losses, especially of the water-soluble vitamins, may be extensive, provision should be made for them in planning practical dietaries. The computation of losses prior to consumption, and means of decreasing these losses, while matters of great practical importance, are beyond the scope of this bulletin. The allowances are meant, however, to provide for possible incomplete availability or absorption of certain nutrients such as iron and calcium.

The allowances are intended to serve as a guide for planning an adequate diet for every normal person of the population and not merely for the average member of the group categories. Experience has shown that the biological normal consists of a range of values. An allowance based on the need of the average of a group would be greater than the need of many and less than the need of many others. Many normal adult males require only 2,200 calories or less and many can subsist in health with half the stated protein allowance. Many children need no supplemental vitamin D, while others require the amount stated. In order to meet the needs of the whole population it is necessary to satisfy the requirements of those with less efficient usage. Because the allowances take into consideration the requirements of those of the upper level of the normal range of requirement, they allow a factor of safety for persons who have an average or less

Recommended Daily Dietary Allowances[1]

Revised 1948

Food and Nutrition Board, National Research Council

	Calories[2]	Protein Gm.	Calcium Gm.	Iron mg.	Vitamin A[3] I.U.	Thiamine[4] mg.	Riboflavin[4] mg.	Niacin (Nicotinic acid)[4] mg.	Ascorbic acid mg.	Vitamin D I.U.
Man (154 lbs., 70 Kg.)										
Sedentary	2,400	70	1.0	12[5]	5,000	1.2	1.8	12	75	[6]
Physically active	3,000	70	1.0	12[5]	5,000	1.5	1.8	15	75	[6]
With heavy work	4,500	70	1.0	12[5]	5,000	1.8	1.8	18	75	[6]
Woman (123 lbs., 56 Kg.)										
Sedentary	2,000	60	1.0	12	5,000	1.0	1.5	10	70	[6]
Moderately active	2,400	60	1.0	12	5,000	1.2	1.5	12	70	[6]
Very active	3,000	60	1.0	12	5,000	1.5	1.5	15	70	[6]
Pregnancy (latter half)	2,400[7]	85	1.5	15	6,000	1.5	2.5	15	100	400
Lactation	3,000	100	2.0	15	8,000	1.5	3.0	15	150	400
Children up to 12 yrs.[8]										
Under 1 yr.[9]	110/2.2 lb. (1 Kg.)	3.5/2.2 lb. (1 Kg.)	1.0	6	1,500	0.4	0.6	4	30	400
1–3 yrs. (27 lbs., 12 Kg.)	1,200	40	1.0	7	2,000	0.6	0.9	6	35	400
4–6 yrs. (42 lbs., 19 Kg.)	1,600	50	1.0	8	2,500	0.8	1.2	8	50	400
7–9 yrs. (58 lbs., 26 Kg.)	2,000	60	1.0	10	3,500	1.0	1.5	10	60	400
10–12 yrs. (78 lbs., 35 Kg.)	2,500	70	1.2	12	4,500	1.2	1.8	12	75	400
Children over 12 yrs.[8]										
Girls, 13–15 yrs. (108 lbs., 49 Kg.)	2,600	80	1.3	15	5,000	1.3	2.0	13	80	400
16–20 yrs. (122 lbs., 55 Kg.)	2,400	75	1.0	15	5,000	1.2	1.8	12	80	400
Boys, 13–15 yrs. (108 lbs., 49 Kg.)	3,200	85	1.4	15	5,000	1.5	2.0	15	90	400
16–20 yrs. (141 lbs., 64 Kg.)	3,800	100	1.4	15	6,000	1.7	2.5	17	100	400

1 Objectives toward which to aim in planning practical dietaries: The recommended allowances can be attained with a good variety of common foods which will also provide other minerals and vitamins for which requirements are less well known.

2 Calorie allowances must be adjusted up or down to meet specific needs. The calorie values in the table are therefore not applicable to all individuals but rather represent group averages. The proper calorie allowance is that which over an extended period will maintain body weight or rate of growth at the level most conducive to well-being.

3 The allowance depends on the relative amounts of vitamin A and carotene. The allowances of the table are based on the premise that approximately two-thirds of the vitamin A value of the average diet in this country is contributed by carotene and that carotene has half or less than half the value of vitamin A.

4 For adults (except pregnant and lactating women) receiving diets supplying 2,000 calories or less, such as reducing diets, the allowances of thiamine and niacin may be 1 mg. and 10 mg. respectively. The fact that figures are given for different calorie levels for thiamine and niacin does not imply that we can estimate the requirement of these factors within 500 calories, but they are added merely for simplicity of calculation. In the present revision, riboflavin allowances are based on body weight rather than caloric levels. Other members of the B complex also are required, though no values can be given. Foods supplying adequate thiamine, riboflavin, and niacin will tend to supply sufficient of the remaining B vitamins.

5 There is evidence that the male adult needs relatively little iron. The need will usually be provided for if the diet is satisfactory in other respects.

6 The need for supplemental vitamin D by vigorous adults leading a normal life seems to be minimum. For persons working at night and for nuns and others whose habits shield them from the sunlight, as well as for elderly persons, the ingestion of small amounts of vitamin D is desirable.

7 During the latter part of pregnancy the calorie allowance should increase to approximately 20 per cent above the preceding level. The value of 2,400 calories represents the allowance for pregnant, sedentary women.

8 Allowances for children are based on the needs for the middle year in each group (as 2, 5, 8, etc.) and are for moderate activity and for average weight at the middle year of the age group.

9 Needs for infants increase from month to month with size and activity. The amounts given are for approximately 6 to 8 months. The dietary requirements for some of the nutrients such as protein and calcium are less if derived largely from human milk.

FURTHER RECOMMENDATIONS:

Fat. There is available little information concerning the human requirement for fat. Fat allowances must be based at present more on food habits than on physiological requirements. While a requirement for certain unsaturated fatty acids (the linoleic and arachidonic acids of natural fats) has been amply demonstrated with experimental animals, the human need for these fatty acids is not known. In spite of paucity of information on this subject there are several factors which make it desirable (1) that fat be included in the diet to the extent of at least 20 to 25 per cent of the total calories and (2) that the fat intake include essential unsaturated fatty acids to the extent of at least 1 per cent of the total calories. At higher levels of energy expenditure, e.g., for a very active person consuming 4,500 calories and for children and for adolescent persons, it is desirable that 30 to 35 per cent of the total calories be derived from fat. Since foodstuffs such as meat, milk, cheese, nuts, etc., contribute fat to the diet, it is necessary to use separated or "visible" fats such as butter, oleomargarine, lard, or shortenings to supply only one-third to one-half the amounts indicated.

Iodine. The requirement for iodine is small, probably about 0.002 to 0.004 mg. daily for each kilogram of body weight, or a total of 0.15 to 0.30 mg. daily for the adult. This need is met by the regular use of iodized salt; its use is especially important in *adolescence* and *pregnancy*.

Water. A suitable allowance of water for adults is 2.5 liters daily in most instances. An ordinary standard for diverse persons is one milliliter for each calorie of food. Most of this quantity is contained in prepared foods. At work or in hot weather, requirements may reach 5 to 13 liters daily. Water should be allowed *ad libitum*, since sensations of thirst usually serve as adequate guides to intake except for infants and sick persons.

Salt. The needs for salt and for water are closely interrelated. A liberal allowance of sodium chloride for the adult is 5 grams daily, except for some persons who sweat profusely. The average normal intake of salt is **10 to 15 grams daily, an amount which meets the salt requirements for a** water intake up to 4 liters daily. When sweating is excessive, one additional gram of salt should be consumed for each liter of water in excess of 4 liters daily. With heavy work or in hot climates 20 to 30 grams daily may be consumed with meals and in drinking water. Even then, most persons do not need more salt than usually occurs in prepared foods. It has been shown that after acclimatization persons produce sweat that contains only about 0.5 gram to the liter in contrast with a content of 2 to 3 grams for sweat of the unacclimatized person. Consequently after acclimatization, need for increase of salt beyond that of ordinary food disappears.

Phosphorus. Available evidence indicates that the phosphorus allowances should be at least equal to those for calcium in the diets of children and of women during the latter part of pregnancy and during lactation. In the case of other adults the phosphorus allowances should be approximately 1.5 times those for calcium. In general it is safe to assume that if the calcium and protein needs are met through common foods, the phosphorus requirement also will be covered, because the common foods richest in calcium and protein are also the best sources of phosphorus.

Copper. The requirement for copper for adults is about 1 to 2 mg. daily. Infants and children require approximately 0.05 mg. for each kilogram of body weight. The requirement for copper is approximately one-tenth that for iron. A good diet normally will supply sufficient copper.

Vitamin K. The requirement for vitamin K usually is satisfied by any good diet except for the infant in utero and for the first few days after birth. Supplemental vitamin K is recommended during the last month of pregnancy. When it has not been given in this manner, it is recommended for the mother preceding delivery or for the baby immediately after birth.

Folic Acid. Evidence for recognizing folic acid (pteroylglutamic acid, vitamin B_c, L. casei factor or vitamin M) as an essential human nutrient is presented in the text. The quantitative requirement cannot be closely **estimated from evidence now available.**

Menu No. 1

MODERATE-COST MENU FOR A PHYSICALLY ACTIVE MAN

Foods	Amt. Gm.	Approximate Measure	Calories	Protein Gm.	Calcium mg.	Iron mg.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Milk	488	2 c.	332	17	576	.4	780	.18	.84	.6	6
Egg	50	1	77	6	26	1.3	550	.05	.14	....	0
Beef, pot roast	100	Med. serv.	309	26	11	3.1	0	.05	.20	4.1	0
Potato, boiled	200	2 med.	166	4	22	1.4	40	.18	.06	2.0	28
Peas, canned	100	½ c.	68	3	25	1.8	540	.11	.06	1.0	8
Beans, baked New England style	200	1 c.	250	12	112	4.2	60	.10	.08	1.0	4
Carrots, raw	50	1 small	21	1	19	.4	6,000	.03	.03	.3	...
Cabbage, raw	50	½ c.	12	1	23	.3	40	.03	.03	.2	25
Orange	100	1 small	45	1	33	.4	190	.08	.03	.2	49
Prunes, stewed	100	½ c.	125	1	25	1.8	890	.03	.08	.8	1
Butter or margarine	42	3 tbsp.	300	...	9	....	1,380	....	....	....	0
Oatmeal, cooked	200	¾ c.	126	5	18	1.4	0	.20	.04	.4	0
Oatmeal cookies	50	2 large	228	4	24	1.0	54	.12	.08	.4	0
Bread, white, enriched	138	6 sl.	378	12	126	2.4	0	.36	.24	3.0	0
Bread, Boston brown	100	2 sl.	219	5	185	2.9	140	.13	.17	1.9	0
Pie, custard	130	1/7 of 9″ pie	266	7	162	1.6	290	.07	.21	.4	0
Cream, light	45	3 tbsp.	90	1	45	0	360	....	.06	....	0
Sugar	12	1 tbsp.	48	0	0	0	0	0	0	0	0
Total	...	....	3,060	106	1,441	24.4	11,314	1.72	2.35	16.3	121
Compared with recommended allowances	...	....	3,000	70	1,000	12	5,000	1.5	1.8	15	75

Menu No. 2

LOW-COST MENU FOR A PHYSICALLY ACTIVE MAN (SOUTHERN)

Foods	Amt. Gm.	Approximate Measure	Calories	Protein Gm.	Calcium mg.	Iron mg.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Turnip greens, cooked	145	1 c.	43	4	376	3.5	15,370*	.09*	.59*	1.0	87*
Sweet potatoes, cooked	200	1 large	246	4	60	1.4	15,400	.18	.10	1.2	40
Cowpeas, cooked	160	1 c.	151	11	59	4.0	620*	.46*	.13*	1.3	32*
Tomatoes, canned	100	½ c.	19	1	11	.6	1,050	.06	.03	.7	16
Cornbread, enriched	145	3 2½x3″ pcs.	318	10	201	2.7	180	.24	.33	1.8	0
Corngrits, enriched	240	1 c.	122	3	2	.7	100	.11	.08	1.0	0
Biscuits, enriched, self-rising flour	114	3 biscuits	381	9	252	2.1	0	.27	.27	2.4	0
Buttermilk	244	1 c.	86	8	288	.2	10	.09	.43	.3	3
Milk, evaporated	60	¼ c.	86	4	153	.1	252	.03	.23	.1	...
Pork, fresh	100	1 med. serv.	400	24	11	3.1	0	.53	.24	4.7	0
Salt pork	75	1 serv.	588	3	.....	.4	0	.14	.03	.6	0
Margarine	28	2 tbsp.	202	...	6	....	920	....	....	....	0
Molasses	60	3 tbsp.	138	...	174	3.6	......	....	....	....	0
Peanut butter	32	2 tbsp.	184	8	24	.6	0	.04	.04	5.2	0
Total	...	....	2,964	89	1,617	23.0	33,902	2.24	2.50	20.3	178
Compared with recommended allowances	...	....	3,000	70	1,000	12.0	5,000	1.5	1.8	15.0	75

*If cooked for a long time in a large amount of water, these factors will be reduced considerably.

than average requirement. In most categories this factor of safety for the average person is estimated to be approximately 30 per cent; nevertheless, it is probable that for many normal persons the allowances cover only the amounts needed for maintenance. Inasmuch as some persons who receive less than the recommended allowance of one or another nutrient may remain in health through long periods, it becomes apparent that these allowances are not to be used as the sole criteria for judging the state of nutrition of any population. Persons whose consumption equals or exceeds the goals are presumed to be adequately nourished in accordance with the basis for setting up the allowances. Not all people who fail to reach the goals, however, are necessarily malnourished.

In spite of careful explanation as to the meaning of this yardstick and how it should be used, there has been a tendency, ever since the publication of the first edition, for some enthusiastic promoters of nutrition to misuse the figures. Results of dietary surveys have been interpreted carelessly in making comparisons with the recommended allowances. Sometimes the inference has been drawn that diets which failed to meet these levels were subminimum and that persons living on such diets were malnourished and likely to show signs of deficiencies. Such conclusions ignore the broad margin between optimum allowances and minimum requirements.

The problems that arose with the feeding of civil populations in liberated countries after World War II emphasized that the liberal margins of safety highly desirable in normal times might become untenable when whole nations were starving. It then becomes desirable to raise the diet of as many people as possible to the minimum-requirement levels. When Americans were required, during the war, to curtail consumption of meat, cheese and fats, at no time were the restrictions such as to cut the average consumer much, if any, below recommended allowances. Even if it did so for certain groups, the restrictions were well within the margin of safety provided by the allowances.

In using the nutrition yardstick it is to be emphasized that the amounts of the various nutrients, with the exception of vitamin D, can be obtained through a good diet of natural foods. Flour or bread should be whole-grain or enriched. It is fortunate that optimum nutrition can be provided by an unlimited number of combinations of different foods. Excessive use of vitamin-poor foods should be avoided, of course, and loss and waste in preparation and in serving should be kept to a minimum. The translation of the allowances into sample menus to fit different localities and incomes is discussed later in this chapter.

The basic dietary pattern outlined in Chapter 1 provides for an ample supply of the eight nutrients other than vitamin D with a total caloric value of only 1,500. Other foods chosen to suit appetite, growth and activity needs might add substantially to these figures.

SAMPLE MENUS—NUTRITIVE VALUE CALCULATED

Various dietary patterns might be suggested that would measure up equally well to the yardstick of good nutrition. It is important to recognize personal, family and regional pref-

erences when planning meals, especially for the sick. This has an important bearing also on the ultimate success of any nutrition program. When a person has a poor appetite, it is unwise to introduce unfamiliar or disliked foods. To attempt to do so often prejudices people against desiring to apply nutrition information. Too often the idea of "eating what is good for you" has meant eating food that was personally distasteful. Thus the nurse or the nutritionist must take pains in interpret needs in terms of favorite foods available in the particular locality, in season and suitable to the income level of the group concerned.

The first suggested menu for an adult man is of moderate cost and is suited to a large part of the United States, particularly northern and central areas. The menus for the three meals are suggested, and the nutritive value is calculated in tabular form on page 128. It will be noted that the food value of this menu exceeds the recommended allowances with a liberal margin in all factors:

MENU NO. 1

Breakfast:

Orange
Oatmeal
Whole milk
Egg
Toast and butter
Coffee with cream and sugar

Lunch:

Baked beans
Cabbage slaw
Boston brown bread and butter
Stewed prunes
Oatmeal cookies
Milk

Dinner:

Pot roast of beef
Potatoes, boiled
Carrot strips, raw
Peas, canned or frozen
Bread and butter
Custard pie
Coffee with cream and sugar

The second menu for an adult man is low-cost and typical of certain groups, especially in the southern part of the United States.

MENU NO. 2

Breakfast:

Grits and pork gravy
or
Corn-meal pancakes, fat pork and molasses
Coffee with evaporated milk

Lunch:

Hot biscuits
Peanut butter
Molasses
Turnip greens

Dinner:

Pork shoulder
Sweet potatoes
Tomatoes
Cow peas
Buttermilk
Corn bread and margarine

The second list of foods contains less milk, no fruit, no egg and less variety, but it measures up to recommended allowances almost as well as the first. It must be remembered that the calcium from greens may not be as readily available as that from milk, but the liberal supply allows for some not being used. Also, the larger proportion of carotene from vegetables may not be as efficient as vitamin A from animal sources, but there are several times the recommended allowance of this

factor. (See calculation on p. 129.)

Numerous other combinations could be equally adequate and adapted to available food supplies and dietary customs. It is recommended that the student calculate a day's menu typical of her own family and locality. In so doing it will be noted that each food in such a list plays a specific role and, if omitted, has to be replaced by another of similar food value to keep the day's menu adequate. A knowledge of food equivalents makes it easier to plan for variety in meals while keeping the food value adequate.

STUDY QUESTIONS

1. Quantitative estimates of human dietary needs have been offered at various times, but with some divergence of opinion. Why is it difficult to calculate dietary requirements?

2. The Food and Nutrition Board of the National Research Council has recommended dietary allowances for certain specific nutrients. Which ones are listed in this table? Which others are considered under Further Recommendations? And why?

3. These allowances are listed for different age and sex categories. For which of these are the allowances as great for young children as for a grown man? Why?

4. For which factors do the allowances vary directly with the caloric requirements?

5. The recommended allowances for children are estimated for age groups. How is the average value for each age group computed and what values would you use for a 12-year-old boy large for his age?

6. The recommended allowances may be met by a variety of natural foods. Make substitutions in the sample menus given without lowering any nutrient below the recommended level.

7. Choose any dietary pattern with which you are familiar and plan a day's menu to meet the recommended allowances, using foods well liked by the people for whom it is intended.

CHAPTER TEN

Meal Planning for the Family

MEAL PLANNING TO FIT FAMILY NEEDS
A FOOD PLAN FOR GOOD NUTRITION
MENUS AND MARKET ORDER FOR A FAMILY OF FOUR FOR A WEEK
ECONOMY HINTS

MEAL PLANNING TO FIT FAMILY NEEDS

The nutritive requirements of children and elderly people are somewhat different from those of adults in the prime of life. It would be folly to give a small child everything that appears on the family menu. However, this menu should be planned in such a way that few special foods need be prepared for him. The question of food for children is discussed in detail in Chapters 13 and 14; of course, any member of the family who is ill must have special consideration. However, all diets should be planned around the family menu, as the essentials are the same for all. Therapeutic diets are discussed in Part Two.

The elderly person, too often a forgotten member of the household, may require some special foods or food preparation, but so far as possible he or she should be a member of the family at mealtime and eat foods prepared for the family. If digestive ability is limited, the family meals should be so planned that the older person may avoid fried foods, rich sauces, pastries and other foods that disagree with him. When lack of mealtime appetite makes an adequate food intake difficult, a midmorning and a midafternoon lunch of something light, such as hot malted milk or orange juice, may be offered. A hot drink at bedtime may be welcomed by an older person and may help to induce sleep. (See Chap. 15.)

From the foods necessary for good nutrition, meals that appeal to the appetite may be planned. These should be varied, although not at the expense of food essentials. When the food budget is liberal, it is naturally much easier to plan interesting meals.

A moderate cost food plan for a week is given on pages 130, 131. When more money is available, the allowances for meat, fresh fruits and vegetables, butter and certain luxuries may be increased. In this case the amounts of potatoes, dried vegetables, bread and cereals may decrease automatically. It is well to use whole grain or enriched bread and cereals. After planning menus, a market order for a family of any

size may be made out from the allowances given.

Breakfast

The breakfast menu should be simple but abundant. A substantial breakfast is a good starter for a busy day or a hard day. Only persons of sedentary habits who rise late and lunch early can profitably omit the morning meal; those who lead a strenuous life should fortify themselves by a well-selected breakfast.

Breakfast should provide some source of good quality protein, such as milk or egg, as well as fruit, toast or cereal and a beverage. Orange or grapefruit or the juice of either, fresh or frozen, is a good choice, because these fruits are rich sources of vitamin C. Other fruit juices, tomato juice, sliced banana, cooked fresh or dried fruit, or canned fruit also may be used at breakfast.

A hot cereal, such as oatmeal or a whole-wheat product, usually is served when there are children in a family. The ready-to-eat cereals are convenient when time is important, although they are more expensive than home-cooked cereals. Many cereals of both types now have one or more vitamins and minerals added to help restore whole-grain nutritive value to them in part. Whole milk always should be served with the cereals. This may be supplemented by cream. Cereal at breakfast gives an opportunity to use a portion of the milk that should be consumed each day.

Eggs and Bacon. This favorite American breakfast has much to be said for it nutritionally. Breakfast is a good time to get the egg a day recommended by many nutritionists, and bacon, high in fat, has the staying quality that prevents those forenoon hunger pangs. Recent work indicates that foods such as bacon and eggs, which are largely protein and fat, are less likely than carbohydrate to stimulate a rapid rise and a subsequent drop in blood sugar. A low blood sugar is often responsible for the exhaustion experienced by people who eat a light breakfast with a large proportion of starch and sugar.

Toast or rolls, which are usually served at breakfast, may supplement the cereal or, if taken in sufficient quantities, may replace it. In this case care should be taken to utilize the milk at another meal unless it is used as such or in cocoa with breakfast.

A hot beverage is a desirable part of breakfast for most adults. Coffee is the general choice in this country, although tea, cereal coffee or cocoa may replace it. Cocoa made with milk may be provided for the children if they will not take milk itself, but they never should be allowed tea or coffee.

Dinner

Dinner, which may be served at noon or at night, is the main meal of the day. Certain types of menus are used customarily at this meal. If luncheon is eaten away from home by any members of the family, a special effort should be made to supply at dinner protective foods that may have been lacking at luncheon. The main course for dinner generally consists of meat, potatoes or a cereal product such as rice, spaghetti or macaroni, at least one green vegetable, bread in

some form, a dessert and a beverage. A salad should be added if it has not been part of the luncheon menu. A hot soup or an appetizer of some sort may introduce the meal. A clear soup or a consommé usually is chosen as a dinner soup.

Meat, Poultry or Fish. Roasts, steaks, chops or stews of lamb, mutton, pork, beef or veal, as well as poultry, game or fish, prepared in different ways, provide a wide variety of main dishes for the dinner menu. Variety meats and alternate dishes made with eggs, cheese, beans or nuts may be used as the main dish occasionally.

Vegetables. Potatoes, either white or sweet, and at least one other cooked vegetable are usually included in the dinner menu. Green and yellow vegetables are especially recommended for their nutritive value and also for a variety in color and texture.

Salads. A green salad usually is chosen for dinner service. Of the salad vegetables, lettuce is most generally available. It is used extensively but is not so rich in minerals or vitamins as most other leafy vegetables. Romaine, escarole, endive, chicory, watercress, cabbage and raw spinach may be used by themselves or in mixed form. French dressing usually is served with green salads at dinner.

Dessert may be simple or elaborate, but it should be adjusted to the rest of the meal. If the meal is comparatively rich or heavy, the dessert should be simple. Fresh fruits are excellent desserts, especially for children and elderly people, since they are easily digested and are rich in the vitamins. Many delicious desserts may be made with milk and eggs in combination with bread, cake, cereals or fruits. Such desserts introduce good nutritive values. Desserts that are excessively rich in sweets or fats should be avoided, especially in the diets of children and invalids. Many acute digestive disturbances are due to too much fat or too much sweet.

Luncheon or Supper

The third meal of the day may be either a luncheon or a supper. It may serve as a means of making up any dietary deficiency that may have existed in the other two meals. If the full quota of milk has not been consumed, it would seem advisable to serve a cream soup or chowder, cocoa for beverage or a dessert with a custard foundation; or, if the leafy vegetable has not been represented in the dinner meal, a salad would be indicated. A more substantial salad may serve as the main course for luncheon, especially in warm weather.

Several authorities now recommend light midmorning and midafternoon lunches of fruit or other simple foods as a means of increasing efficiency.

MENUS AND MARKET ORDER FOR A FAMILY OF FOUR

The food allowances suggested on pages 136 and 137 are convenient for estimating a week's food needs for a family. They are grouped according to the Basic Seven plan to ensure good nutrition for all. The choice of foods within the groups should be made according to season and taking into account taste preferences of all the members of the

A Food Plan for Good Nutrition for the Family*
(Quantities for One Week)

Kinds of Food	For Children 1 to 6 Years Old	For Children 7 to 12 Years Old	For Girls 13 to 20 Years Old	For Boys 13 to 20 Years Old	For Women		For Men, All Activities	Total Suggested for Your Family
					All Activities	Pregnant and Nursing		
Leafy, green and yellow vegetables	2–2½ lbs.	2½–3 lbs.	3½ lbs.	3½–4 lbs.	3½–4 lbs.	4 lbs.	3½–4 lbs.	
Citrus fruits, tomatoes	2–2½ lbs.	2½–3 lbs.	3 lbs.	3–3½ lbs.	2½–3 lbs.	3½–4½ lbs.	2½–3½ lbs.	
Potatoes, sweet potatoes	½–1 lb.	1½–2 lbs.	2½ lbs.	3½–4½ lbs.	2–3 lbs.	2–3 lbs.	3–5 lbs.	
Other vegetables and fruits	2 lbs.	2½ lbs.	3½ lbs.	3½ lbs.	3–4 lbs.	3–3½ lbs.	3–4 lbs.	
Milk, cheese, ice cream (milk equivalent)[1]	6 qts.	7 qts.	6–7 qts.	7 qts.	5 qts.	7½–10½ qts.	5 qts.	
Meat, poultry, fish[3]	1–1¼ lbs.	2 lbs.	2½–3 lbs.	3 lbs.	2½–3 lbs.	3 lbs.	3–3½ lbs.	
Eggs	6–7	7	7	7	6–7	7	6–7	
Dry beans and peas, nuts	1 oz.	2 ozs.	2 ozs.	4–6 ozs.	2–4 ozs.	2 ozs.	4 ozs.	
Baked goods, flour, cereals (flour equivalent)[1] Whole grain, enriched or restored	1–1½ lbs.	2–3 lbs.	2½–3 lbs.	4–5 lbs.	2–4 lbs.	2–2½ lbs.	3–7 lbs.	
Fats, oils	¼ lb.	½–1 lb.	¾ lb.	1–1½ lbs.	¾–1 lb.	¾ lb.	1–2 lbs.	
Sugar, sirups, preserves	¼–½ lb.	¾ lb.	1 lb.	1–1½ lbs.	¾–1 lb.	¾ lb.	1–1½ lbs.	

[1] For explanation of milk-equivalent and flour-equivalent foods:
On the basis of calcium they contain, the following may be used as alternates for 1 cup of milk: Cheddar cheese, 1⅓ ozs.; cream cheese, 15 ozs.; cottage cheese, 11 ozs.; ice cream, 2 to 3 large dips.
Quantities suggested in the food plan are in terms of pounds of flour and cereal. Bread and other baked goods average two-thirds flour by weight. Therefore, count 1½ pounds of bread and other baked goods as 1 pound of flour.

[2] Larger quantities are for the younger girls.

[3] To meet the iron allowance needed by children from 1 to 6 years old, girls from 13 to 20, and pregnant and nursing women, include weekly 1 large or 2 small servings of liver or other organ meats.

* Family Fare, U. S. Dept. of Agr., Home & Garden Bull., No. 1, 1950.

Market Order for a Week

For family of two adults and two children (6 and 10 years old)

Leafy, green and yellow vegetables	1 head lettuce
	2 lbs. snap beans
	2 bunches carrots
	2½ lbs. spinach
	2 lbs. squash
	1 head of cabbage (small)
	1 No. 2 can or 1 pkg. frozen green peas
	1 pkg. green Lima beans (frozen)
Citrus fruit, Tomatoes	4½ to 5 lbs. oranges or 2 cans frozen orange juice
	2 grapefruit
	1 46-oz. can tomato juice
	1 large can tomatoes
Potatoes, Sweet Potatoes	2 lbs. sweet potatoes
	6 lbs. potatoes
Other Vegetables and Fruit	2 lbs. apples
	3 lbs. other fruit in season or canned
	1 No. 2½ can peaches
	1 lb. prunes
	½ lb. raisins
	1 bunch celery
	1 lb. onions
Milk, Cheese, Ice Cream	15 qts. fresh whole milk
	1 14½-oz. can evaporated milk
	1 lb. nonfat dry milk solids (makes 5 qts.)
	¼ lb. cheddar cheese
	½ to 1 lb. cottage cheese
	1 pt. ice cream
Meat, Poultry, Fish	3 to 3½ lbs. chuck roast of beef
	2 to 3 lbs. shoulder of lamb
	¾ lb. liver
	1 lb. fish (haddock, cod, halibut)
	1 can tuna or salmon
Eggs	2 doz.
Dry Beans, Peas, Nuts	8 ozs. split peas
	4 ozs. peanut butter
Flour, Cereals, Meal, Baked goods	3 loaves enriched bread
	3 loaves whole-wheat bread
	1 loaf rye bread
	1¼-lb. box rolled oats or whole-wheat cereal
	1 pkg. ready-to-eat cereal
	2 lbs. enriched flour or corn meal
	½ lb. macaroni or spaghetti
	1 box graham or other crackers
Fats, Oils	½ lb. bacon
	1½ lbs. butter or margarine
	½ lb. shortening
	½ pt. salad dressing or salad oil
Sugar, Sirup, Preserves	2 lbs. sugar
	½ to 1 pt. molasses, honey, jelly or preserves

Suggested Menus for a Week for a Family

(See market order page 137)

Sunday

Breakfast:

Orange juice
Scrambled eggs
Toast and butter or margarine
Preserves
Milk for children
Coffee or tea for grown-ups

Dinner:

Pot roast with carrots, potatoes and onions
Chopped spinach
Bread and butter or margarine
Two-egg sponge cake with ice cream
Milk for children
Coffee or tea for grown-ups

Supper:

Open-faced grilled cheese and bacon sandwich for grown-ups
Hot wheat cereal with milk for children
Shredded cabbage and raisin salad
Fruit in season
Milk

Monday

Breakfast:

Prunes with orange slices
Hot oatmeal with milk
Toast and butter or margarine
Milk for children
Coffee or tea for grown-ups

Lunch:

Cream of tomato soup with toast squares
Tuna fish and celery salad
Bread and butter or margarine
Baked Indian pudding
Milk

Dinner:

Beef casserole with mounds of mashed potatoes (beef left from Sunday roast)
Green peas
Fruit salad
Bread and butter or margarine
Sponge cake with honey sauce
Milk

Tuesday

Breakfast:

Grapefruit
Soft-cooked eggs
Toast and butter or margarine
Milk for children
Coffee or tea for grown-ups

Lunch:

Baked macaroni and cheese
Snap beans
Shredded raw carrots
Bread and butter or margarine
Oatmeal and prune pudding (oatmeal left from Monday breakfast)
Milk

Dinner:

Broiled liver
Baked potato
Baked squash
Tossed green salad flavored with chopped crisp bacon
Bread and butter or margarine
Fruit in season
Milk

Wednesday

Breakfast:

Orange or orange juice
Ready-to-eat cereal with milk
Toast and butter or margarine
Preserves
Milk for children
Coffee or tea for grown-ups

Lunch:

Split pea soup
Apple, cabbage and raisin salad
Bread and butter or margarine
Baked Indian pudding
Milk for children
Coffee or tea for grown-ups

Dinner:

Beef hash with potatoes (beef left from Sunday)
Home-made vegetable relish
Creamed carrots and peas
Celery
Bread and butter or margarine
Fruit cup
Milk

THURSDAY

Breakfast:

Tomato juice
Hot oatmeal with milk
Toast and butter or margarine
Milk for children
Coffee or tea for grown-ups

Lunch:

Creamed eggs on toast or
Soft-cooked eggs with toast
Jellied fruit salad
Molasses cookies
Milk

Dinner:

Baked shoulder of lamb
Baked sweet potato
Green Lima beans
Cole slaw
Bread and butter or margarine
Canned peaches
Graham crackers
Milk

FRIDAY

Breakfast:

Orange
Hot wheat cereal with raisins and milk
Toast and butter or margarine
Milk for children
Coffee or tea for grown-ups

Lunch:

Cream of pea soup
Cottage cheese and peach salad
Bread and butter or margarine
Cookies
Milk for children
Coffee or tea for grown-ups

Dinner:

Baked fish
(haddock, cod or halibut)
Sliced beets
Baked potato
Celery
Bread and butter or margarine
Lemon snow with custard sauce
Milk for children
Coffee or tea for grown-ups

SATURDAY

Breakfast:

Tomato juice
Ready-to-eat cereal with milk
Toast and butter or margarine
Preserves
Milk for children
Coffee or tea for grown-ups

Lunch:

Peanut butter and celery sandwiches
Vegetable salad
Floating island or junket
Milk for children
Coffee or tea for grown-ups

Dinner:

Minced lamb on riced potatoes
(lamb left from Thursday dinner)
Snap beans
Hearts of lettuce with dressing
Applesauce
Graham crackers
Milk

A 6-oz. serving of milk is allowed for the children. If the children do not drink all their milk, they have it as part of the afternoon snack.

family. Age grouping for children is broad in order to keep the table simple and easy to use. There will be considerable variation in the needs of children of different sizes and ages within one group. Children over 12 may eat as much or more than an adult.

As an example of how this table may be used for a hypothetical family of four, two adults, a 6-year-old boy and a 10-year-old girl have been chosen. The husband, of average height and height, is moderately active, walks to work and usually comes home for lunch. The wife is of slight build but very active, doing all her own housework and caring for two small children. She probably would need less food than her husband. The younger child would be in the earliest age group given in the table of allowances, the 10-year-old in the second group. The specific needs for children at different ages are discussed in Chapter 14. Most of the time the same meals may be planned for all the family. Certain modifications can be made for the children when the adults prefer a dessert or other dish which is not suitable for children. It is simpler for the homemaker if the adults adjust their food habits somewhat to those of the children.

The suggested menus for a week and a market order to provide the necessary items for this family of four are given in this chapter. It is suggested that each student plan menus and a market order for her own family or a family group that she knows intimately. This experience allows taste preferences and individual needs to be taken into account.

ECONOMY HINTS

Modifications in the menus and the market order may be made when it is necessary to reduce costs. Intelligent adjustments can ensure that meals are still nutritionally adequate and acceptable to the family.

Fruits and vegetables in season and when plentiful are better nutritionally and usually cheaper than canned or frozen. However, home-frozen foods are good economy if home-produced, and they can be prepared to suit family tastes. They can be superior to the commercial types if they are frozen properly and used promptly after thawing. As a rule, carrots and cabbage are inexpensive and can be used raw or cooked. Fresh greens in season and wild greens in some areas may be used in place of more expensive green vegetables. Canned fruits and vegetables can replace fresh products when these are expensive or out of season. Canned tomatoes are cheaper and often higher in vitamin C than raw tomatoes out of season. During some seasons either canned or frozen orange juice is cheaper than fresh and has about the same nutritive value. Sectioned or sliced orange provides more nutritive value than the juice extracted from the same orange. Canned tomatoes or tomato juice, canned grapefruit juice and low-cost fresh fruits may be used in place of orange juice. These are not so high in vitamin C, but more can be served.

The nutritive value of cheaper standard grades of canned fruits and vegetables is essentially the same as that of the more expensive

fancy grades, and they are canned under equally sanitary conditions.

Milk and Dairy Products. Either evaporated or dried milk is cheaper than fresh milk and is entirely satisfactory for cooking. Both products have some use as a beverage. When dry skim milk (fat-free milk solids) is used in place of whole milks, some source of vitamin A, such as more generous amounts of green or yellow vegetables or fortified margarine, should be used. Practically all margarine on the market today has the vitamin A value of average butter and is entirely satisfactory as a substitute for butter for both cooking and table use. Cream is an expensive food. For economy, top milk may be used, if adequate provision is made for the children to have their full quota of whole milk. Sometimes evaporated milk may be used in place of cream. Inexpensive cheese is as good a source of protein as more expensive or processed types.

Meats, Poultry, Fish and Eggs. Cheaper cuts of meat may be used when it is necessary to cut food costs. A rough estimate of the cost of the edible portion of some of the apparently cheapest cuts may disclose that the cheapest food is not always the cut which has the lowest price tag per pound. Variety meats, such as pork or lamb liver, pork heart and beef tongue, are often good buys, both for protein and vitamins. As a rule, fish is cheaper than meat and is a good source of protein. Poultry is usually an expensive source of protein because of the high proportion of waste. When meats are high, main dishes of beans or peas may be used occasionally and peanut butter for sandwiches. Grade B eggs are as nutritious as grade A and usually are cheaper. Eggs of graded size show considerable variation in price —sometimes small eggs are the best buy, sometimes large ones. Fat from bacon and other meats can be saved and used for many cooking purposes.

Bread, Cakes and Cereals. In general, foods prepared at home are less expensive than foods purchased ready to eat. Sweet rolls, buns, coffee cakes are expensive types of bread. Breakfast cereals cooked at home are cheaper than the ready to eat, but the latter are preferred by many. Large-size packages are economical for big families, but not for small ones, as the opened package may become stale and have to be discarded.

STUDY QUESTIONS

1. Which factors are most difficult to obtain in sufficient quantities in low-cost meals in your locality at the season of year when you are studying this chapter?
2. Choose any person of your acquaintance whose diet is restricted in certain foods and make the necessary substitutions to provide a diet that meets the recommended allowances.
3. Select a family that you know with at least three growing children. Assume that they are on a liberal income and plan the day's menu and make out the market order.
4. If the family produces some of its own food, calculate the total amount needed for a week from chart on page 136 and then estimate market order to supplement home-produced foods.

CHAPTER ELEVEN

Regional, National and Cultural Food Patterns

UNDERSTANDING THE SIGNIFICANCE OF FOOD HABITS
REGIONAL DIFFERENCES IN FOOD PATTERNS IN THE UNITED STATES
DIETARY PATTERNS OF NATIONAL GROUPS
JEWISH
ITALIAN
HUNGARIAN
POLISH AND SLAVIC
ARMENIAN, TURKISH AND GREEK
DIETARY PATTERNS (cont.)
CHINESE
JAPANESE
MEXICAN
PORTUGUESE
PUERTO RICAN
NUTRITIONAL PROBLEMS OF TRANSPLANTED PEOPLES
FAVORITE NATIONAL AND REGIONAL DISHES

UNDERSTANDING THE SIGNIFICANCE OF FOOD HABITS

A problem that often confronts the public health nurse or the nutritionist concerns regional or national food habits. Our population has come from all parts of the world and has brought a variety of dietary habits and tastes quite as fixed as our own. Dietary problems among foreign-born families are bound to arise because of the fact that foods that have been staples in their diet may now be expensive, while foods that have been considered luxuries are comparatively cheap. Sugar and white bread, for instance, are among the least expensive foods in this country, while milk, vegetables and fruit are often comparatively expensive. The public-health nurse often will have an opportunity to guide families of foreign extraction toward an adequate choice of food. Food customs and religious regulations must be considered when the nurse gives advice in regard to food selection. If the nurse considers these with understanding and sympathy, her aid will be valued.

Upon examination of national dietary habits, it is found that the majority of peoples of the rural class live sanely in their own countries, but on arrival in America they find conditions so changed from those of their own land that it is often difficult for them to make the necessary adjustment. Not knowing that one food is more valuable than another, or that certain things are essential while others are merely pleasant ad-

FIG. 31. In Sumatra a *salamatan* is a party given to celebrate the beginning of a new venture. Note that the women and the children stand and wait until the men finish eating. (Standard Oil Co., New Jersey)

juncts, they are likely to choose their new diets unwisely.

In the past, many of the immigrants who came to our shores were of the farming class. Some had been accustomed to raising their own produce, to having their own goats or cows for the production of milk and the manufacture of cheese, their own chickens, ducks and geese, and their own fruit trees and vineyards. It is very difficult for them to realize that milk, for instance, can possibly be worth from 18 to 22 cents per quart, especially since they believe it to be a drink and not a food. Many of these people also are accustomed to goat's milk and find it difficult to make the change to cow's milk. Therefore, milk often is one of the first foods on which the family economizes. The children may drink coffee or, possibly, tea in its place. On the other hand, second-generation families from southern European stock have adopted the use of milk, even for adults, although this was not the custom in their own country

In their own countries, most of the nationality groups were accustomed to cooking vegetables with meat; but, here again, the price of vegetables seems exorbitant and their use may be reduced far below what is necessary for health. In the majority of instances, the great problem of the nutrition worker and the nurse is to teach these people the value of milk and vegetables in the diet and to assist in planning the budget so as to cover these two necessary items.

If the nurse or the social worker knows the family food customs, this will play an important part in establishing good relations. Characteristic food habits of every regional or national group should be respected, because there are good nutritional practices in many of them. Emphasis should be placed on the desirable features of the established food pattern and methods of preparation that preserve maximum food values. A family may be encouraged to continue its own methods of preparation and seasoning when these are not incompatible with health and then gradually institute necessary changes to correct poor practices. This means the dietary customs must be analyzed and checked against the food standards that have been set according to the foods in general use in this country.

Success in making necessary changes in lifetime habits demands sympathy and understanding. Special diets should be interpreted for the patient or the homemaker in terms of the regional or the national food pattern. A woman of foreign birth or one from a different part of the country may have little contact outside her home and little opportunity to learn how to use foods that are new to her. The marked improvement in homes where the mother has had the opportunity to learn to adjust to local foods and customs shows that instruction, as well as understanding, is an important phase of nutrition work.

While it was once held that the stature of certain races was due to climate, now it is generally believed that these racial differences are partially the result of differences in food. Holt states that statistics show that Japanese children in the United States, both boys and girls, are taller and heavier than those of corresponding ages living in Japan; also that children of the successful and prosperous Russian Jews—those who have become to a considerable degree Americanized—are almost as large as those of our native-born population, the children frequently being 4 or 5 inches taller than their parents. However, no such results are seen among the very poor, where the mode of life and food has altered little from that of the parents. While happiness, usefulness and even success in life are by no means dependent upon the height and the weight of the individual, a fine physical development is always desirable. A frail body or habitual poor health is a serious handicap in life.

In this chapter special attention is given to regional and national food patterns which are distinctive. A knowledge of these food preferences and attention to them may help to build the bridge of understanding between the health worker, the nurse or the nutritionist and the family that she is trying to assist.

REGIONAL DIFFERENCES IN FOOD PATTERNS IN THE UNITED STATES

Anyone who has traveled in different parts of the United States and has eaten meals typical of various regions is aware of differences in menus, food preparation and local terms for foods or special dishes. Part of the joy of travel is in eating the traditional foods of each locality. On the other hand, natives of certain regions who relocate for various reasons may have strong preferences for familiar dishes. Boys in the Army indicated such preferences, and these were considered when possible.

People who are ill are much more likely to want familiar foods cooked in a traditional manner. Therefore, it is pertinent for the dietitian and the nurse to recognize some of these regional differences which exist in our own country. In some instances, modification of a familiar pattern of eating may be recommended to meet nutritional requirements.

In the South, hot breads are served at nearly every meal, and baker's yeast breads are not popular. There is a preference for vegetables that have been cooked a long time and often with fat pork. Undoubtedly some vitamins are destroyed by this process, but the common use of pot-liquor conserves the nutrients which are in solution. The wide variety of greens used compensates in a measure for the low consumption of milk and cheese as sources of calcium and vitamins. The scarcity of fresh milk in some localities has encouraged the use of evaporated and dry milk.

In the Southwest, the Mexican influence is shown in the use of beans and highly seasoned dishes. Again, milk production is limited and, while the drinking of fresh milk was not part of the original pattern of eating, it is being introduced gradually. In the Mexican home preparation of corn for tortillas, the lime used introduces calcium, an essential mineral which otherwise would have been deficient.

In the Far West, the infiltration of Oriental cultures has influenced food habits. The wide variety of garden produce and locally grown citrus fruits, the short-time cooking of vegetables typical of Oriental cooking, and the serving of generous salads as the first course are features to be commended.

In the north central states, there is a mixed racial background with a strong northern European and Scandinavian heritage in many localities. Even third-generation homes still maintain characteristic native dishes, perhaps modified by regional choice of ingredients. Many of these states produce and use large quantities of dairy products, especially cheeses of several varieties closely resembling European types. The so-called typical American diet is really an adaptation of much of the northern European food pattern. This is only natural, since climatic conditions and crops are similar. Locally grown fruits and vegetables are used in season and preserved for winter use.

On the east coast and in New England, many traditional dishes have come down from the Pilgrim settlers. The use of corn meal in Indian pudding and johnnycake was acquired from the Indians by their

new neighbors. Baked beans, codfish cakes, clam or fish chowder and turkey for festive occasions are all old New England traditions, some of which have been adopted nationally. A smaller variety of green, leafy vegetables still is used in New England than in many other areas, but yellow vegetables, such as squash, turnips and carrots, are popular.

In isolated communities in any part of the country, unusual food habits may be encountered. Malnutrition may result from a limited variety of foods grown locally, especially if soil and drinking water happen to lack essential nutrients and if the economic status does not allow of the extensive use of foods from other producing areas. Sporadic outbreaks of actual deficiency diseases have been reported occasionally. Such instances are less common today, since state health departments are recognizing their responsibilities for these conditions quite as much as they are for the control of communicable disease.

In metropolitan areas a great variety of food patterns may be found. In large cities, there may be whole sections in which the inhabitants follow as closely as possible the food customs of the country from which they have emigrated. This influence is retained to some extent by a second generation. People who come to the city from regions of the United States where definite types of foods are preferred continue to attempt to follow the diet to which they have been accustomed. Usually they can be persuaded to supplement their meals with the foods that are more generally available in the city than they were in the part of the country where their food habits were established.

DIETARY PATTERNS OF NATIONAL OR CULTURAL GROUPS

Jewish Dietary Habits

Probably one of the most difficult dietary problems for the social worker is that of the Jews, because of the many religious restrictions that are applied to the diet. No social worker can afford to ignore the religious ideas or customs of a people, for confidence is the basis upon which all successful social work rests.

The following description of the dietary laws of the Jews is quoted from *Foods of the Foreign Born*,[1] and from *Jewish Dietary Problems*:[2]

1. Prohibited Foods

Prohibition of Animal Foods. Absolute and partial prohibitions:

Unclean animals are absolutely prohibited. Clean animals all are quadrupeds that chew a cud and also divide the hoof. All others are regarded as not clean.

Products of animals that are suffering from some malady or that have died a natural death or had eaten poison are regarded as "terefah," unclean, and may not be used.

All animal foods which are not obtained by killing in the prescribed manner and after adequate inspection by a duly authorized official may not be used.

Blood was regarded by the ancient Hebrews, and by many primitive peoples today, as the vital part of the animal which must be given back to God. Fish does not come under this category, pos-

[1] Wood, Bertha M.: Foods of the Foreign Born, New York, Barrows, 1929.

[2] Schapiro, Mary L.: Jewish Dietary Problems, J. Home Econ., Feb., 1919.

sibly because it is a cold-blooded animal.

Fish that have fins and scales—none other—may be eaten. This would bar all shellfish, such as oysters or lobsters, as well as fish of the eel variety.

No scavengers or birds of prey are to be eaten. These are regarded as unclean.

The suet of ox, sheep, or goat is forbidden (not the fat). Fat of birds or permissible wild animals is not forbidden.

An egg yolk with a drop of blood on it is considered as an embryo chick, and is forbidden.

2. Prescribed Modes of Preparing Food

The following partial prohibitions are fully as important as the above:

After the proper cut of meat is secured from the proper kind of animal which has been slaughtered in accordance with Jewish Law, it is to be soaked half an hour to soften the fiber and enable the juice or blood to escape more readily when salted. (The pan used for this purpose may not be used for anything else.) The meat is then thoroughly salted, placed on a board which is either perforated or fluted, and placed in an oblique position, so as to enable the blood to drain off. It is allowed to remain thus for one hour, after which time it is to be washed three times. The washing is for the purpose of removing all the salt. This process is called kosher and is regarded as very important.

Bones with no meat and fat adhering to them must be soaked separately, and during the salting should be placed near the meat.

Chops and steaks may be broiled.

The heart may be used, but must be cut open lengthwise, and the tip removed before soaking. This enables the blood to flow out more freely. Lungs are treated as is the heart. Milt must have veins removed. The head and feet may be koshered, with the hair or skin adhering to them. The head must have the brain removed. This latter is used, but must be koshered separately.

To kosher fat for clarifying remove the skin and proceed as with meat. In preparing poultry, it must be drawn and the insides removed before putting into the water. The claws must be cut off before koshering. The head must be cut off. The skin of the neck must be either turned back or cut, so that the vein lying between two tendons may be removed.

Seething a kid in its mother's milk is forbidden. This is the origin of the prohibition against the cooking of the meat and milk together, or of the eating of such mixtures. This rule is rigidly adhered to, and in its present application necessitates the use of a complete double equipment of dishes and utensils. Since this rule is regarded as one of the most important, one can understand why such sauces as butter sauces or white sauce are refused at meals with meat. This rule occasions the home-economics teacher considerable trouble in planning menus.

Meat and fish should not be cooked or eaten together, for such a mixture is supposed to cause leprosy. The mouth has to be washed after eating fish and before meat may be eaten.

3. Jewish Holidays

Sabbath: No food may be cooked on the Sabbath. This means that all cooking for both days is done on Friday. This need has led to the development of foods such as Sabbath Kugel or Sholend, Petshai, and many others.

Passover: During Passover week no leavened bread or its product, or anything which may have touched leavened bread, may be used. This restriction holds for eight days. In every Jewish home a complete and most thorough system of cleaning precedes this holiday. No corner escapes a scrubbing and scouring, lest a particle of leaven, or what is just as bad, a particle of food which may have touched leavened

bread, should be found. A complete new set of dishes is used during the week. Cutlery, silver, or metal pots may be used during this holiday if properly koshered or sterilized. The usual method of doing this is to plunge red-hot coals into boiling water, and then to immerse the desired utensils. These or any other Passover utensils may be used after the holiday is over without rekoshering, but once used without Passover precautions they are unfit for Passover use unless rekoshered. In actual practice this means that in every orthodox Jewish household there are four sets of dishes—the usual set for meat and the set for milk food, in addition to duplicate Passover sets. The Passover dishes are stored away very carefully, lest some leaven come near them.

Because of the need for abstaining from leavened bread during Passover, many interesting dishes have developed, such as the Mazzah Klos (dumplings), soup, cakes and puddings made of the mazzah meal. Almond pudding and cake are very popular. Almost all of the food cooked during this holiday requires the liberal use of shortening or fat, with great danger of a too liberal use for health, as well as from the economic point of view. The fat generally used is either goose or chicken drippings, or clarified beef fat other than suet.

Fast Days: (A) Yom Kippur (the Day of Atonement). No food or drink may be had for 24 hours. (B) Fast of Esther. This precedes the Feast of Purim and is now observed only by the very pious. The Feast of Purim is universally observed.

Semifast Days: Eight days in Ab. For nine days no meat food may be eaten by the orthodox.

A striking characteristic of the Jewish diet is the richness of the food, including pastries and cakes, foods rich in fats, and preserves and conserves, as well as stewed and canned fruits. Pickles and "sours" are also used abundantly. No pork or pork products are used. Meat and milk must not be served in the same meal. Butter, being a product of milk, must not be served with meat. Most vegetables, therefore, are cooked with the meat. Cooked vegetables are more often served in soup than otherwise. Borscht, a soup made with "sour salt" (tartaric acid) and vegetables to which sour cream is added, is a favorite dish but is not served with the meat meal. This limits the amount of vegetables used, although the salad vegetables—lettuce, cucumbers, tomatoes and scallions—are served quite frequently, either plain or with sour cream. Cereals, especially barley and buckwheat (kasha), are served as a vegetable with meat or in soup, either in a meat stock or cooked in milk.

Noodles and other egg-and-flour mixtures are used quite extensively.

Rye and whole-wheat breads are well liked, as well as crusty rolls.

Dried fruits, as well as fresh, are used by those who can afford them.

Fish is served quite frequently, especially cod, haddock, carp, salmon and white fish, as well as the smoked and the salted fishes—herring, salmon and sturgeon. Gefüllte fish is a delicacy prepared in almost all Jewish homes. Chicken is considered almost an essential for the Sabbath evening meal.

In prescribing diets for the Jewish people, it might be helpful, both to the person who prescribes and the patient for whom the diet is prescribed, to remember that all their foods may be classified under three heads: (1) Meat or fish; (2) milk and its products; and (3) neutrals. Meat and milk are never mixed. Neutrals may be used with meat

or with milk products, but never with both in the same meal.

Because milk in any form cannot be served with meat at the same meal, the diet of Jewish children often lacks the proper amount of milk. The use of more milk for the children, more green vegetables and canned vegetables and fresh and canned fruits for the whole family should be stressed. The continued use of rye bread, legumes, coarse cereals, dried fruits and a variety of fish which are characteristic of the Jewish diet is advantageous.

Italian Dietary Habits

The Italian immigrants who come from northern and central Italy are chiefly farmers. Italy has much the same climate as that of California; consequently, fruits and vegetables are grown there in abundance and are used freely. Goat's milk is used, especially for the children. Cheese is also made from it and used freely. Eggs are in common use. Macaroni is made in various forms and used in many dishes, "maccheroni" being the national dish. Macaroni is only one variety of several "pastas." Rice grown locally is also used in many dishes. Dark bread made from the whole wheat is a standby. Approximately 40 per cent of the native Italian diet is from wheat in some form and from 60 to 70 per cent from grain and potatoes combined, the root vegetables being used more in the north than in the south of Italy.[3] Olive oil or lard is used in various ways in cooking. Very little meat is used by the average Italian.

[3] Bennett, M. K.: Food for Postwar Europe, Food Research Institute, Stanford Univ. Press, War-Peace Pamphlet No. 5, 1944.

In southern Italy, where fishing is one of the chief occupations, fish is used extensively. Garlic and green peppers are used abundantly. The food is more highly seasoned in southern Italy than in other regions. Wine, often homemade from native grapes, is used widely, and may appear upon the table at every meal. The combination of bread and cheese with wine is considered satisfactory for use at any meal of the day.

The Tuscan and the Umbrian peasantry live almost exclusively on the "minestra," which word is usually translated "soup," made of vegetables with meat stock. On gala occasions noodles or rice are added, and grated cheese always is sprinkled thereon.

A typical Italian breakfast consists of black coffee for adults, milk for children, and bread without butter. The noonday meal consists of bread, cheese and black coffee, with perhaps one of the many kinds of sausages, or, if the meal is taken at home, fried eggs may be served. The evening meal is the principal meal of the day, since the family are often working in the fields or away from home at midday. The menu at this meal is a little more varied, although it usually consists of one dish. Meat or beans often serve as a basis. The cooking of this dish is started in the morning. Later on, vegetables are added and still later macaroni and the fat, which may be lard or olive oil. Polenta, a thick cornmeal mush, to which tomatoes, cheese or a bit of pork and garlic has been added, is another favorite dish, and bread and butter are served with this dish.

The Italian immigrant finds coffee in America cheaper than in his own

country, and it is not uncommon to find the children partaking of this beverage in place of milk. The Italian buys food in small quantities, such as the breast of a chicken or merely one wing, using such pieces to flavor a whole dish. As there are few refrigerators, perishable food never is provided in great abundance.

The Italians have many kinds of cheese, which are used freely. However, they have a strong aversion to American cheese, and an investigation conducted in New York disclosed the fact that when Roman cheese cost $1.25 a pound, it was considered such an essential that in the poorest Italian homes, where the investigator found the family suffering from the cold and the lack of food, it was still being purchased in small quantities. However, a taste for sweets is acquired rapidly in this country, the children eating a great deal of candy between meals. This, together with too much coffee and too little milk, is the most difficult phase of the nutritional problem among Italian children. The trend in recent years has been toward more milk both for children and for adults as incomes became more adequate and education in the value of milk more widespread.

While the use of green vegetables and fruits in the Italian diet is to be commended, there should be encouragement in the use of milk, coarse cereals, root vegetables and potatoes. Candy between meals and coffee for the children should be discouraged.

Hungarian Dietary Habits

In the native Hungarian diet, between 50 and 60 per cent of the calories are from grains and potatoes. Pork, either fresh or cured, is the favorite meat, especially in rural areas. As a rule, Hungarian foods are more highly seasoned than the average European dishes. Paprika is used freely as a seasoning, likewise onions and fresh peppers, both green and red. Sour cream is used both as a sauce and in certain cooked foods. Sauerkraut is popular. Fish and shrimp are well liked and used frequently. Eggs are used extensively, and fruits are particularly well liked. The use of more raw vegetables and improved methods of cooking vegetables should be encouraged, as should the use of more cereals and milk.

Polish and Slavic Dietary Habits

Potatoes and bread are major items in the Polish food pattern, grains and potato together providing from 60 to 70 per cent of the total calories. Rye and buckwheat flour are used freely. Coarse cereals may be cooked in milk but rarely are served with milk. Potatoes are eaten at almost every meal. Pork and pork products, especially sausage, highly seasoned, are popular, but meat of any kind is a luxury in rural areas. Fresh, salted and pickled fish are favorite foods. Cabbage may be used raw, as kraut or cooked, and most vegetables are cooked with meat. Sour cream and cottage cheese are used extensively.

The use of more milk (particularly for the children), of more raw vegetables and of more fruits should be encouraged. These people may profitably increase the use of canned tomatoes in winter, a custom only recently accepted in Europe.

Armenian, Turkish and Greek Dietary Habits

The inhabitants of the Near East are an outdoor people. Most of them are farmers: they raise their own sheep, goats, cattle, chickens, ducks and geese; they produce their own grains and grow fruits and vegetables in abundance. Grains, rice or wheat furnishes the major source of calories. The whole wheat is parboiled and cracked for use as a staple starchy food at the main meal. Eggs, butter and cheese also are produced on the farm. Lamb is the favorite meat. The food is not highly spiced but is rich in fat. The fat is cooked with the food and this serves in place of butter. Matzoon, or Yoghurt, a sour-milk preparation, is used almost universally by these people; sweet milk is seldom used. Black coffee, in which the pulverized bean is retained, is the preferred beverage.

Chinese Dietary Habits

The Chinese diet is varied, consisting of eggs, meat, fish, cereals and a large variety of vegetables. Many plants and weeds, such as radish leaves and shepherd's purse, are used, as well as various sprouts (bean, bamboo, etc.). The soybean is grown abundantly, and some 30 or more products are manufactured from it. The protein is high and of good quality.

Rice is used freely and takes the place of American bread, particularly in southern China. In northern China, wheat, corn and millet seed are used in abundance. The millet seed (ground or whole) is made into cakes or a thin mush, the latter being the form in which it is given to children. Noodles are widely used. Grains and, in some areas, sweet potatoes constitute the chief source of calories in the Chinese diet; grain and potato together provide from 70 to 90 per cent of the total calories.

The quantity of meat eaten is small, and usually it is served with vegetables. These are cut into small uniform pieces in conformity with an ancient law laid down by Confucius, the philosopher, specifying that food should not be eaten unless it had first been chopped or cut into small pieces. Pork is the chief meat of the poorer classes. Lamb and goat meat are used when available, but beef is uncommon.

In certain parts of China, a child rarely tastes cow's milk, but water buffalo milk is used to some extent. Soybean milk and cheese are more common. When transplanted to this country, the Chinese readily accepts the use of dairy products for children and adults.

The Chinese use practically every part of the animal as food (with the exception of the hair and the bones); even the brain, the spinal cord and the various internal organs, as well as the skin and the blood, are utilized. Coagulated blood is sold on the market in pieces similar to liver and, since this is one of the inexpensive foods, it is used freely. Fish and shellfish are also in common use. They are sold alive, for the Chinese have a strong aversion to dead fish and consider them unfit for food.

Eggs, including hen, duck and pigeon eggs, are used in abundance, when they can be afforded. The Chinese prepare what is known as fermented eggs, which are much relished by them, as well as other types of "preserved" eggs, which are

eaten much as we in this country eat sweets.

Japanese Dietary Habits

The Japanese diet is similar to the Chinese but differs slightly in methods of cooking and seasoning. In general, the Japanese use more fish and a smaller variety of vegetables and grains than the Chinese. Even before World War II, the dairy industry in Japan had developed so that it was possible and safe to buy fresh milk. Eggs are used fresh but not fermented, as in China.

Mexican Dietary Habits

The Mexicans use freely many varieties of beans, as well as rice, potatoes, peas and some vegetables. Chili, a variety of pepper, is also popular. The chili plant is sacred to the Mexican, who is supposed to be blessed in health if he uses it plentifully. The tomato always is prominent in Mexican cookery. Mexicans use little meat and practically always cook it with vegetables. They have a strong aversion to meat that is not perfectly fresh and slaughtered in the approved Mexican style. Chile con carne is a favorite meat dish. It consists of beef seasoned with garlic and chili peppers and cooked several hours. Tamales also are popular. They are made of corn meal and ground pork, highly seasoned; they are rolled in corn husks and steamed. Tortillas, made with ground whole corn which has been soaked in lime water and baked on a griddle, furnish the bread. The lime provided in this fashion supplies some calcium which otherwise would be almost lacking in the diet, which does not usually contain milk or cheese. The use of milk for the children should be encouraged, and if a change to the American type of bread is made, it should be of the whole-grain or enriched type.

Portuguese Dietary Habits

The dietary habits of the Portuguese are similar to those of the Mexicans. Their consumption of wheat products is lower than that of any other southern European country, but use of grains other than wheat is liberal. They use many spices and peppers; allspice and mace are favorites.

Puerto Rican Dietary Habits

Puerto Rican dietary habits are not unlike those of other Latin-American countries. Rice and beans are the staple foods, used almost daily and often cooked together. Salt codfish is used more often than fresh fish. Pork and beef are the favorite meats. Plantain and other root vegetables, along with fresh tomatoes, peppers and onions, are used commonly. Bananas, oranges and pineapples are popular but often expensive, except where they are grown.

Puerto Ricans may well be encouraged to use more milk and cheese, cheaper cuts of meat to supplement the protein at meals when rice and beans are served. Acceptance of canned tomatoes in place of more expensive fresh ones out of season, margarine in place of butter or expensive oils, and cheaper cuts of meat would provide better nutrition for the same cost. Malnutrition and tuberculosis are common among Puerto Rican children living in the United States, an indication of the need for improved nutrition.

NUTRITIONAL PROBLEMS OF TRANSPLANTED PEOPLES

The transplanting of peoples from tropical or semitropical climates to northern parts of the United States presents special nutritional problems. Vegetables and fruits which were cheap in a southern area may be expensive, and it is difficult for people to choose acceptable foods from among those which they can afford. Southern markets may provide a variety of greens which are used abundantly, but cost and lack of variety in northern markets may discourage their use. These same greens may have provided minerals and vitamins essential for health. The limited consumption of milk may not have been as serious for the children eating more of such greens as it is when they move north and fail to make the necessary compensation.

In the case of dark-skinned races, Negroes, Mexicans and others, the children seem to be especially susceptible to rickets in the north, possibly due to lessened exposure to sunlight. Thus more attention to milk and adequate sources of vitamin D is paramount. These same people show increased susceptibility to tuberculosis in the north, and, again, protective foods are important. Thus a marked change in climate may involve adjustments in food to meet modified requirements.

FAVORITE NATIONAL AND REGIONAL DISHES

A study of some of the main dishes of different nationality groups indicates that people the world over eat much the same kinds of foods. They may combine or season them differently or serve them at a different time of day, but they provide the same nutrients. Actually, it is fun to prepare and eat dishes which are the favorites of other nationalities or regions. The United Nations Cook Book[4] offers an opportunity to try dishes from most of the countries which belong to the U.N. Recipes for several popular main dishes from different countries are given in Chapter 49. Numerous regional and foreign cook books are available for those who enjoy trying their culinary skills on unfamiliar dishes.

STUDY QUESTIONS

1. Why is it essential that a public health nurse or a nutritionist be able to adjust her advice on nutrition concerning various regional and national food patterns?
2. What evidence is there that stature may be influenced by nutrition as well as by racial inheritance?
3. After noting the regional dietary habits in the United States, which ones in the South and the Southwest would you recommend and encourage and what changes would you recommend?
4. How has the infiltration of various cultures influenced the food habits of those in various regions of the United States?
5. Why is the Jewish diet one of the most difficult problems for the health worker? What are some of the dietary laws which must be respected?
6. How does the use of grains, potatoes and meat vary among the following racial groups: Italians,

[4] The American Home Economics Association: The World's Favorite Recipes, New York, Harper.

Hungarians, Poles, Greeks and Turks?

7. How can you help others to gain respect for the food habits and the favorite dishes of other nationality and regional groups than their own? Where would you look for recipes?

CHAPTER TWELVE

Nutrition During Pregnancy and Lactation

FOOD DEMANDS OF PREGNANCY
FOOD SELECTION DURING PREGNANCY
COMPLICATIONS OF PREGNANCY
DIET DURING LABOR
DIET AFTER DELIVERY
DIET DURING LACTATION

FOOD DEMANDS OF PREGNANCY

Introduction. Pregnancy makes many demands upon the maternal organism. As would be expected during the period when the body of the unborn infant is being built, the food of the prospective mother needs special consideration. Even the normal healthy woman who has been taking an adequate diet will require more dietary essentials. Formerly, it had been assumed that except in cases of acute deficiencies of food in general, the infant would not be affected materially. In recent years, studies of nutrition of women during pregnancy have shown that there is a definite relationship between the diet of the mother and the condition of the infant at birth. They have also shown that anemia and possibly toxemia can be prevented largely by a diet adequate for both mother and child.

Prenatal nutrition begins before conception. The woman who always has eaten a well-balanced diet has a much better chance of bearing a healthy baby and remaining in good health herself than the woman who suffers from chronic malnutrition. Studies in England[1] show that when the diet is improved in the latter group, dramatic improvement in the number of live births results, but even then the figures are not nearly as good as those for women who never suffered from malnutrition at all.

Nutrition Studies in Pregnancy. In recent years many studies of food intake in pregnancy have been reported. One of the most conspicuous findings is that the diet of a very large percentage of pregnant women does not meet the nutritional allowances recommended by the National Research Council (see p. 126). That these deficiencies are in a large measure related to income levels is also apparent. Jeans,[2] reporting on a

[1] Balfour, M. I.: Lancet 1:208, 1944.
[2] Jeans, P. C., *et al.*: J. Am. Dietet. A. 28:27, 1952.

RECOMMENDED DAILY NUTRITIONAL ALLOWANCES FOR A NORMAL WOMAN DURING PREGNANCY AND LACTATION
(Food and Nutrition Board, National Research Council)

NUTRITIONAL ESSENTIALS	NORMAL SEDENTARY WOMAN	PREGNANCY (4th through 9th month)	LACTATION
Calories*	2,000	2,400	3,000
Protein, Gm.	60	85	100
Calcium, Gm.	1.0	1.5	2.0
Iron, mg.	12	15	15
Vitamin A, I.U.	5,000	6,000	8,000
Ascorbic acid, mg.	70	100	150
Thiamine, mg.	1.0	1.5	1.5
Riboflavin, mg.	1.5	2.5	3.0
Nicotinic acid, mg.	10	15	15
Vitamin D, I.U.	......	400	400

* Energy requirements vary with activity, size of the person, etc.

study in a rural state, found a direct correlation between the amounts of all nutrients present in the diet and the income levels of his patients. Trulson[3] and co-workers, in a study of 1,567 pregnant women of low-income status from both city and rural areas, found that only 20 per cent met the recommended figures for protein intake; only 20 per cent had sufficient milk; and only 25 per cent had sufficient vitamin C in the diet. Berry and Wiehl,[4] studying a small group of pregnant women in New York City, found that the diets of only 16 per cent met the National Research Council standards, while 49 per cent of the diets were rated as poor in that they were below 60 per cent of the National Research Council standards. A hopeful aspect of their paper is the fact that with the teaching of patients the percentage of good diets increased from 16 to 37 per cent, and the poor diet rating diminished from 49 to 31 per cent. The effects of such poor diets will be considered later in the chapter.

[3] Trulson, M., *et al.*: J. Am. Dietet. A. **25**:669, 1949.

[4] Berry, K., and Wiehl, D.: Milbank Mem. Fund Quart. **30**:119, 1952.

It will be seen from the foregoing that the importance of nutrition in pregnancy is poorly recognized by the general population, and that nurses, as well as many others in the medical field, must carry a great responsibility for teaching this group better nutrition.

Nutritional Requirements. The table above shows the nutritional allowances in pregnancy and lactation as compared with those of the sedentary woman (from the Food and Nutrition Board of the National Research Council, see Chap. 9).

CALORIES. While metabolism rises during pregnancy, this occurs largely in the second and third trimesters.

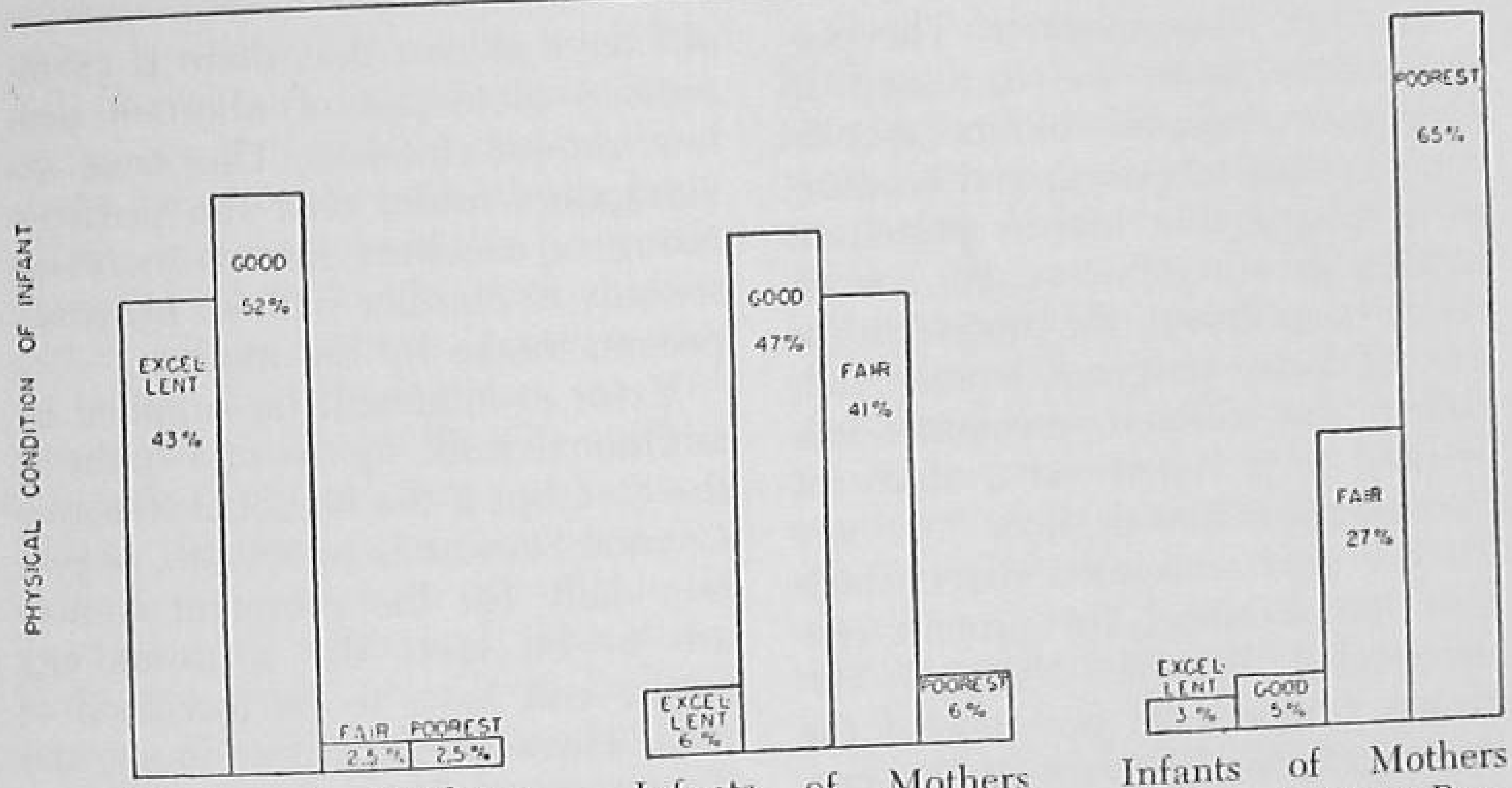


FIG. 32. Condition of infants at birth in relation to the prenatal diet of the mother. Note the decrease in excellent and good ratings for infants and the increase in fair and poorest infants as the diet goes from good to poor (Adapted from Burke, B. S., *et al.:* J. Nutrition 38:453, 1949)

The recommended increase in milk intake from 1 pint to 1 quart will increase the caloric intake by approximately 300 calories. However, the increase in milk intake should begin as soon as pregnancy has been established not for its caloric but for its valuable protein, calcium and vitamin content. There should be no increased intake of purely energy foods such as fat and carbohydrate if the weight is within normal limits. (See Table 13, Part Four.) In cases of underweight, often the sign of undernourishment, the amount of all nutrients should be increased in the interest of preserving the health of both mother and baby.

It is unwise for a pregnant woman to add weight out of proportion to the gain of the new tissue formation in the fetus. The average weight gain should be about 2 pounds a month. The cause of any plus or minus to this amount of gain should be determined, and the proper measures should be taken. In cases of overweight, it may be necessary actually to decrease the quantity of food taken normally. Reduction in food high in carbohydrate and fat will then be indicated. The diet must continue to be adequate in foods which supply protein, minerals and vitamins. In a recent study, Oldham and Sheft[5] have shown that low caloric diets may cause the pregnant woman to use the protein in her diet for the purpose of energy rather than of building new tissue. Reduction diets in pregnancy, therefore, must not be too severely restricted in calories.

[5] Oldham, H., and Sheft, B. B.: J. Am. Dietet. A. 27:847, 1951.

Protein Requirement. The protein intake must be increased in pregnancy because of its specific contributions to growth and because, as a rule, a diet low in protein is lacking in other factors. As has already been shown, the protein in the diet of many pregnant women falls below the amount recommended. Burke,[6] in a report on a study of 216 pregnant women, says: ". . . only 10 per cent consumed diets which met the standard for protein recommended by the National Research Council; 68 per cent of the diets contained less than 70 Gm. protein daily and 38 per cent less than 55 Gm., while 14 per cent contained under 45 Gm. protein daily during this important period of rapid fetal development. A very significant relationship was found between the protein content of the mother's diet during pregnancy and the length of her infant at birth. For practical purposes this study indicates that less than 75 Gm. protein daily during the latter part of pregnancy results in an infant who will tend to be short, light in weight, and most likely receive a low pediatric rating in other respects. Here again in a human study it is impossible to prove that protein alone is the significant nutrient; it may well be that certain of the B vitamins—for example, associated in the foods with protein—are factors in this relationship."

The data presented in Burke's paper have been confirmed by a subsequent study of an additional group of mothers.[7] Likewise, Dieckman *et al.*[8] have shown that there is an increased incidence of abortion with low protein intakes. The same investigators found that the pediatric rating of excellent infants increased steadily in number with an increased protein intake by the mother.

Extra protein will be supplied by additional milk up to one quart in the diet, but if the National Research Council Standards of 85 Gm. of protein daily for the pregnant woman are to be met, the meat-and-egg intake will have to be increased as well. These are expensive foods, and it may not always be possible to obtain them in the desired quantities. Extra protein may be supplied inexpensively by the generous use of dried skim milk in creamed soups and other dishes in which milk is an ingredient. Soybean flour used in combination with other flours will also furnish extra protein at low cost. An increased use of dried peas and beans will add protein to the diet without increasing its cost greatly.

Jeans,[9] in discussing the study already referred to, says:

"The need for greater intake of milk and milk products is of major importance in pregnancy. The addition of even a pint of milk daily would better the intake of protein and riboflavin in the poorest diet to a real degree, and would more than double the present intake of calcium of nearly half the women. . . . The use of low cost dry milk solids would benefit greatly those unable to buy sufficient fresh milk."

Calcium and Phosphorus Requirements. The pregnant woman

[6] Burke, Bertha S.: J. Am. Dietet. A. 20:735, 1944.

[7] Burke, B. S., *et al.*: J. Nutrition 38: 453, 1949.

[8] Dieckman, W. J., *et al.*: J. Am. Dietet. A. 27:1046, 1951.

[9] *Op. cit.*

must be supplied with calcium and phosphorus in quantities large enough for her own needs and those of the bony framework of the body of the growing fetus and for the formation of its teeth. Both mother and child need these minerals also for other body functions, as discussed in Chapter 6. The proper utilization of calcium and phosphorus depends upon the inclusion of a certain amount of vitamin D (see Chap. 7, Vitamins). The allowance of a quart of milk a day will supply a large proportion of the needed calcium and phosphorus, as well as a good proportion of the necessary protein. Methods for incorporating milk into the diet will be discussed later in the chapter.

Iron Requirement. An adequate iron supply during pregnancy is no less important than that of calcium. There is prenatal storage of iron in the fetus for use during the first months of infancy. Clinical studies show that hemoglobin levels tend to be lower in women of the low-income groups. Lund,[10] in a study of a large group of pregnant women in New Orleans, found that 50 per cent of the women had a hemoglobin level below 11 Gm./100 cc. blood, and 20 per cent had levels below 10 Gm. All these women belonged in the low-income groups. This finding may reflect inadequate protein and vitamin intake as well as a diet low in iron, since foods rich in one are often rich in the others also. Therefore, a low hemoglobin level in pregnancy may indicate a generally inadequate diet and endanger the health of both the mother and the infant.

[10] Lund, C. J.: Am. J. Obst. & Gynec. **62**:947, 1951.

Foods especially high in iron are beef and pork liver, one of which should be included at least once a week. Other good sources of iron are heart, kidney, tongue, all lean meats, chicken, eggs, most green, leafy vegetables, potatoes, whole-grain or enriched bread, dried fruits and dried peas and beans. Molasses is an important source of iron in those regions where it is commonly included in the diet. It is not always easy to include sufficient iron in the daily diet, especially in the low-income diet.

Iodine Requirement. Iodine is also an important element in the diet of the pregnant woman. A deficiency of this element during pregnancy may cause goiter in the child or in the mother. The use of iodized salt is suggested for those who live in areas in which the soil and the drinking water are known to be deficient in iodine.

Vitamin Requirement. Undoubtedly, there is an increased need for vitamins during pregnancy, although the actual data supporting the suggested allowances of the National Research Council tables are few.

In the case of vitamin A, Lund,[11] as well as other authorities, advised the use of concentrates during the second and the third trimesters. During this period, tests show a decrease in the plasma vitamin A in the mother, which may be caused by its storage in the liver of the fetus. Foods high in this vitamin should be stressed, particularly the green and deep-yellow vegetables, milk, liver, eggs and butter or fortified margarine.

[11] Lund, C. J.: J.A.M.A. **128**:344, 1945.

The B complex vitamins are all concerned with metabolic processes and, since metabolism is increased in pregnancy, it is essential that there should be a corresponding increase in this group of vitamins.

Warkany and Schraffenberger[12] have shown a relationship between riboflavin deficiency in the rat and certain skeletal defects, but it is not known if these findings are also applicable to man. Although 15 mg. nicotinic acid is recommended for pregnancy by the National Research Council, little is known about the human requirement. Foods high in the B complex vitamins are milk, eggs, lean meat, liver and whole-grain and enriched breads.

The ascorbic acid requirement has been shown to be increased considerably during the latter part of pregnancy. As citrus-fruit juices and tomato juice usually are well liked, the inclusion of a liberal amount in the diet is a wise precaution. When for some reason they are not taken in sufficient quantities, ascorbic acid tablets will be a good and inexpensive source.

While the exact requirement of vitamin D during pregnancy is not known, it is essential for the utilization of calcium and phosphorus. Burke[13] advises that "until more exact knowledge is available, it would seem wise to follow the allowance of 400 I.U. daily recommended by the National Research Council." This may be taken through fortified milk or in the form of a concentrate.

Another vitamin that has a function in pregnancy is vitamin K, which the physician may find beneficial for administration a short time before delivery in order to prevent certain types of hemorrhagic disease.

Mineral oil in any form interferes with the absorption of the fat-soluble vitamins and should be avoided, especially during pregnancy (Chap. 7).

FOOD SELECTION DURING PREGNANCY

It can be seen readily that there should be an increase in the consumption of a variety of foods during pregnancy and not of milk alone, as is commonly believed. Burke[14] summarizes the foods which should be eaten daily (see top of p. 161).

While modification of the diet may be necessary at the various stages of pregnancy, the plan for the day's menu on page 161 can be followed with variations throughout most of the periods.

Methods of Incorporating Milk in the Diet. Some women find it difficult, because of dislike, to incorporate a quart of milk in the diet as a beverage. In such instances, the mother should be given suggestions for milk dishes such as cocoa, cream soups, milk desserts and scalloped dishes. A good milk drink is made from one tablespoonful of molasses added to a glass of milk and flavored with nutmeg. Recipes for the use of dry skim milk powder will be found in Chapter 49. The mother must be warned to count only that quantity of the milk used in cooking which she actually consumes in her portion of the finished product.

12 Warkany, J., and Schraffenberger, E.: J. Nutrition 27:477, 1944.

13 Burke, Bertha S., and Stuart, Harold C.: J.A.M.A. 137:119, 1948.

14 *Ibid.*

Diet in Pregnancy

Whole milk: 1 quart.

Lean meat: One liberal serving (4 ozs.); liver is desirable at least once each week.

Egg: At least one.

Fruit: Two or more servings (1-1½ cups, 200-300 Gm.). Two medium oranges or unstrained orange juice (8 ozs.) or the equivalent should be taken each day.

Vegetables: Two or more servings of cooked or raw vegetables (1-1½ cups, 200-300 Gm.); these should include dark green leafy or deep yellow vegetables, also legumes, several times each week; in addition, a medium potato (150 Gm.) cooked in the skin should be eaten daily.

Bread and cereal: Whole-grain or enriched bread, at least four slices daily (½ cup of cereal is equivalent to 1 slice of bread).

Butter or fortified oleomargarine: 2 tablespoons.

Additional foods: Consisting of either more of the foods already listed or other foods of one's own choice adjusted to individual energy needs and in relation to desired weight gain.

Vitamin D: Some form of vitamin D to supply 400 I.U.

A Day's Meal Plan for the Healthy Pregnant Woman of Average Weight

Breakfast

Fruit: Grapefruit, orange or other fruit or juice rich in vitamin C.

Cereal: Whole grain or enriched, served with milk and a moderate amount of sugar; or an egg.

Bread: One slice, whole grain or enriched, with butter or fortified margarine.

Milk: One glass. Two cups of cocoa made with milk may be substituted if the mother is not gaining weight too rapidly.

Coffee: As desired. Cream and sugar limited if there is too rapid a gain in weight.

Dinner

Meat: A liberal serving of lean meat, fish or poultry. Liver once a week.

Vegetables: A cooked vegetable, preferably green leafy or a deep yellow one. A raw vegetable served as a salad. A potato, white or sweet.

Bread: One slice, whole grain or enriched, with butter or fortified margarine.

Dessert: Desserts made with milk, eggs or fruit should be served often.

Milk: A glass of milk.

Supper or Luncheon

Main dish: A dish made with eggs if these have not been used elsewhere in the menu; or a cheese dish, or legumes; or a meat or fish sandwich.

Vegetable: A cooked vegetable or a salad.

Dessert: Raw or cooked fruit with plain cake or cookies.

Milk: A glass of milk.

Before Retiring

Milk: One glass if there has not been sufficient milk in the menu during the day; or fruit.

DIETARY COMPLICATIONS IN PREGNANCY

Vomiting of Pregnancy. During the first trimester there may be trouble with nausea. Also, there may be lack of appetite during the day. Certain foods which have been taken without trouble previously may cause disturbance. Fats are a common cause of upset, although butter and cream may be tolerated well. However, if they are not, milk may be taken in skimmed form, as most of the dietary essentials remain after the cream has been removed. Sometimes it is better to take a number of small meals a day rather than three regular meals. Hard breads, such as dry toast and crackers, usually are well taken. If pernicious vomiting occurs, it must be treated by the physician.

Overweight in Pregnancy. Pregnancy is usually a time of well-being and is accompanied by an excellent appetite. Most doctors guard against excessive weight gain as being detrimental to both the mother and the fetus. There is a greater strain on all the organs of the body in the overweight pregnant patient. Overweight may lead to complications during delivery. Lastly, there is an increase in the incidence of toxemia in overweight women. (See Fig. 33).

If the mother has a tendency to gain weight easily, some foods should be omitted entirely, such as sugar, candy, jelly and other sweets, oil salad dressings, fried foods, fatty

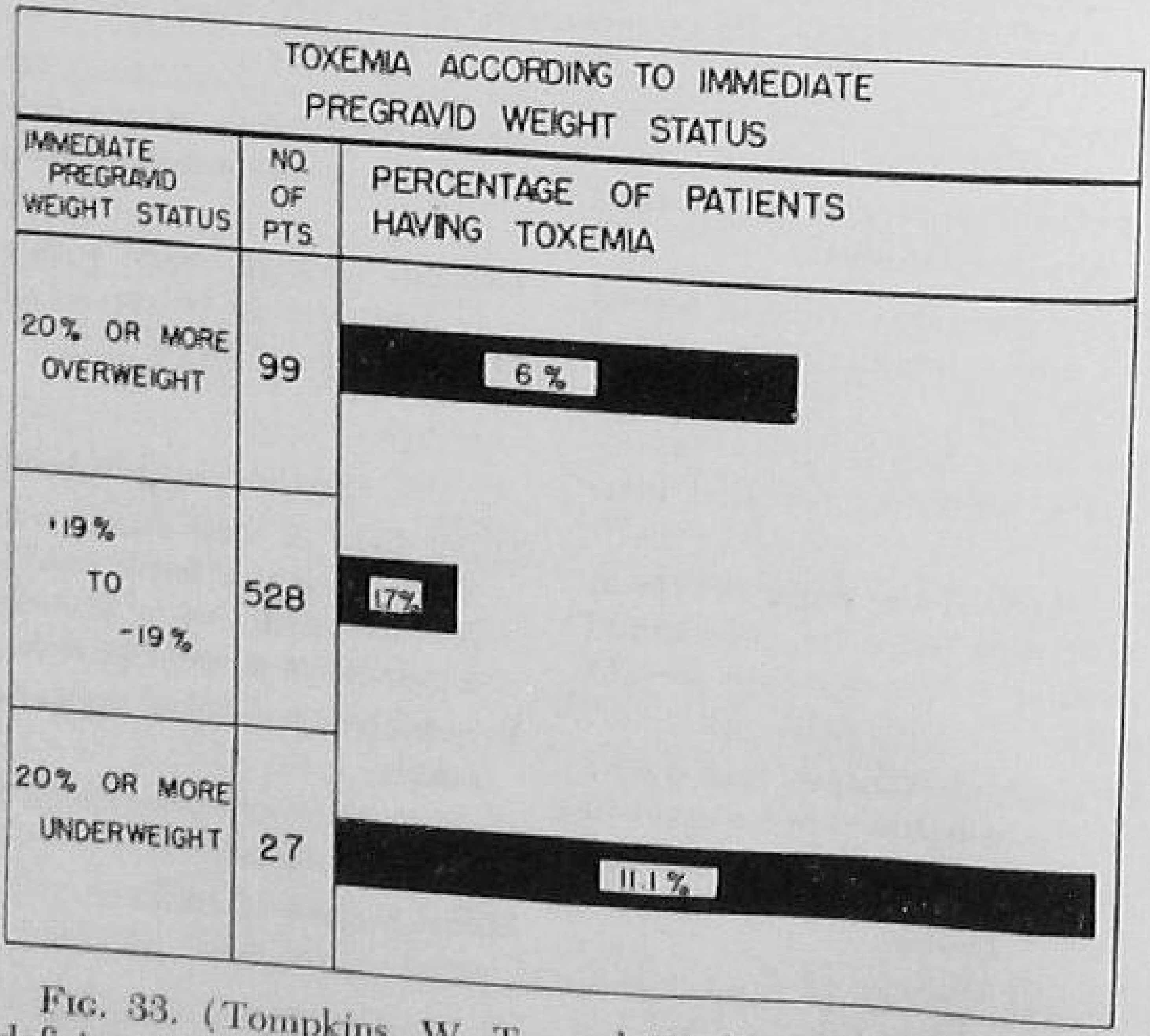


Fig. 33. (Tompkins, W. T., and Wiehl, D. G.: Nutritional deficiencies as a causal factor in toxemia and premature labor, Am. J. Obst. & Gynec. 62:898, 1951)

meats, desserts other than fruit, and carbonated beverages. It may be necessary to limit bread and potatoes, but in such case the diet should be supplemented with the B complex vitamins and possibly iron.

As has been pointed out earlier in the chapter, the protein in the diet may be utilized for energy instead of for growth if the calories are limited too severely. Probably, therefore, the reducing diet should not go below 1,800 calories during the period of pregnancy. If it includes all the essential foods listed on page 161 but has no other additions than coffee and tea without cream and sugar, and broth, it will provide approximately 1,800 calories.

Toxemia of Pregnancy. The cause of toxemia of pregnancy is not known. It is characterized by an elevation in blood pressure, albuminuria and rapid weight gain due to edema. In the eclamptic stage there may be convulsions and coma. There is considerable controversy over the influence of nutrition on the occurrence of toxemia. Toxemia seems to occur more frequently in pregnant women on poor diets, and particularly on low protein intakes, than in corresponding groups on good diets. Burke's findings[15] show that 44 per cent of the women on poor or very poor diets, 8 per cent on fair diets, and none on good or excellent diets developed symptoms of toxemia. Tompkins and Wiehl[16]

15 Burke, B. S., and Kirkwood, B. B.: Am. J. Pub. Health **40**:960, 1950.

16 Tompkins, W. T., and Wiehl, D. G.: Am. J. Obst. & Gynec. **62**:898, 1951.

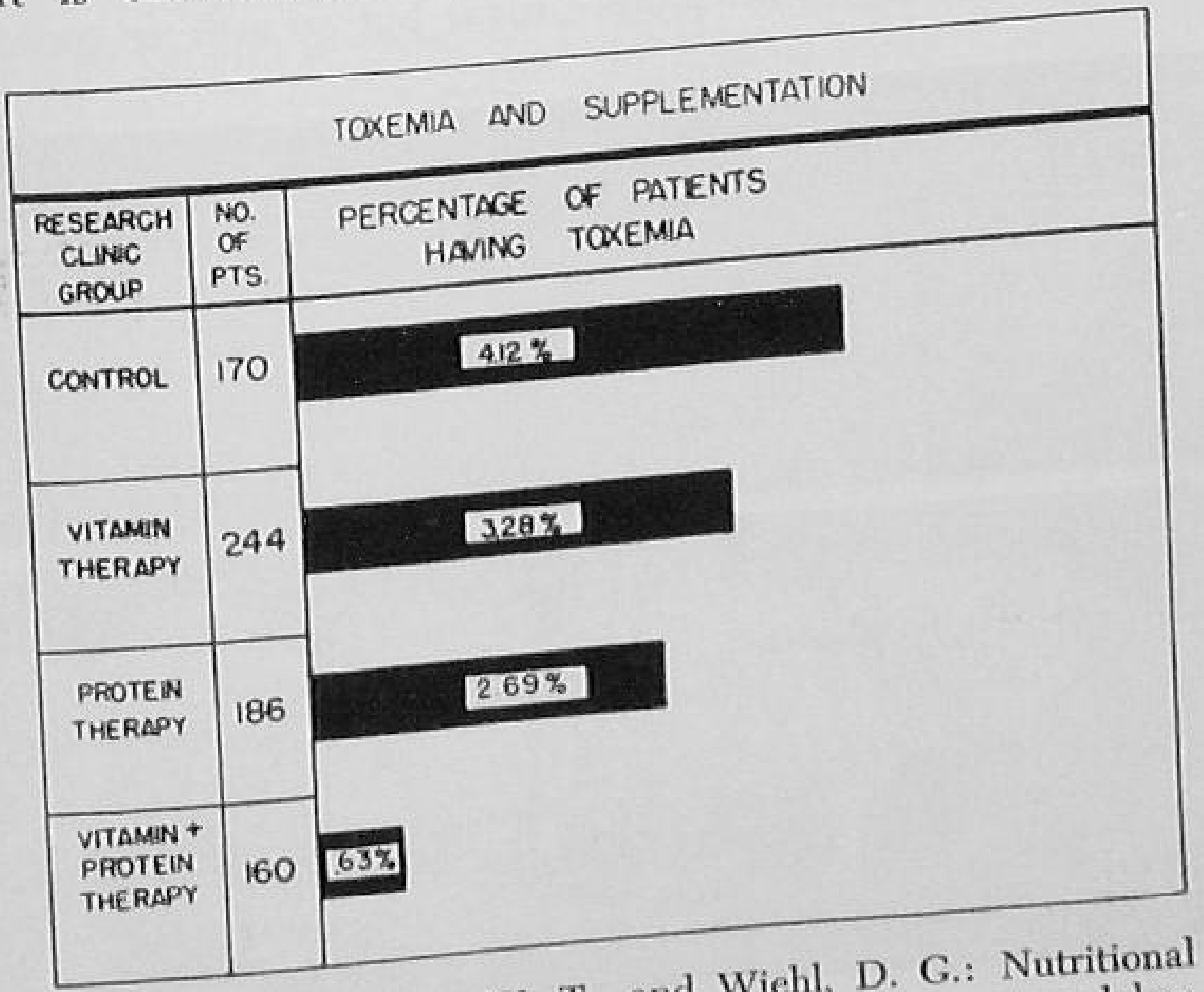


Fig. 34. (Tompkins, W. T., and Wiehl, D. G.: Nutritional deficiencies as a causal factor in toxemia and premature labor, Am. J. Obst. & Gynec. 62:898, 1951)

have shown that in severely underweight patients there is a greatly increased incidence of toxemia not only over those who are normal in weight but those who are overweight. (See Fig. 33.) They have also shown that supplementation of the diet with protein and vitamins greatly reduced the incidence of toxemia in their patients. (See Fig. 34.) All these findings reinforce what was said at the beginning of this chapter: we have not so far made nutrition education in pregnancy an effective tool in maintaining the health of the mother during this period and ensuring a healthy infant at birth.

The dietary treatment of toxemia, once it has occurred, varies considerably, but it is thought generally that in the early stages a diet rich in protein, minerals and vitamins and low in salt and fluids will best meet the needs of the patient. (See Chaps. 25 and 27 for low salt and high protein diets.)

DIET DURING LABOR

During the early stages of labor there need be little variation from the usual diet if the patient can take food without digestive disturbance. During the later stages, food should consist mainly of carbohydrates, as they leave the stomach quickly. Protein and fat tend to remain in the stomach considerably longer, which may result in aspiration if anesthesia is given. The diet may be soft or liquid and will include white bread toast with jelly, soda crackers, canned or cooked fruits, gelatin, fruit juices, ginger ale, broth and tea or coffee with sugar but no milk or cream.

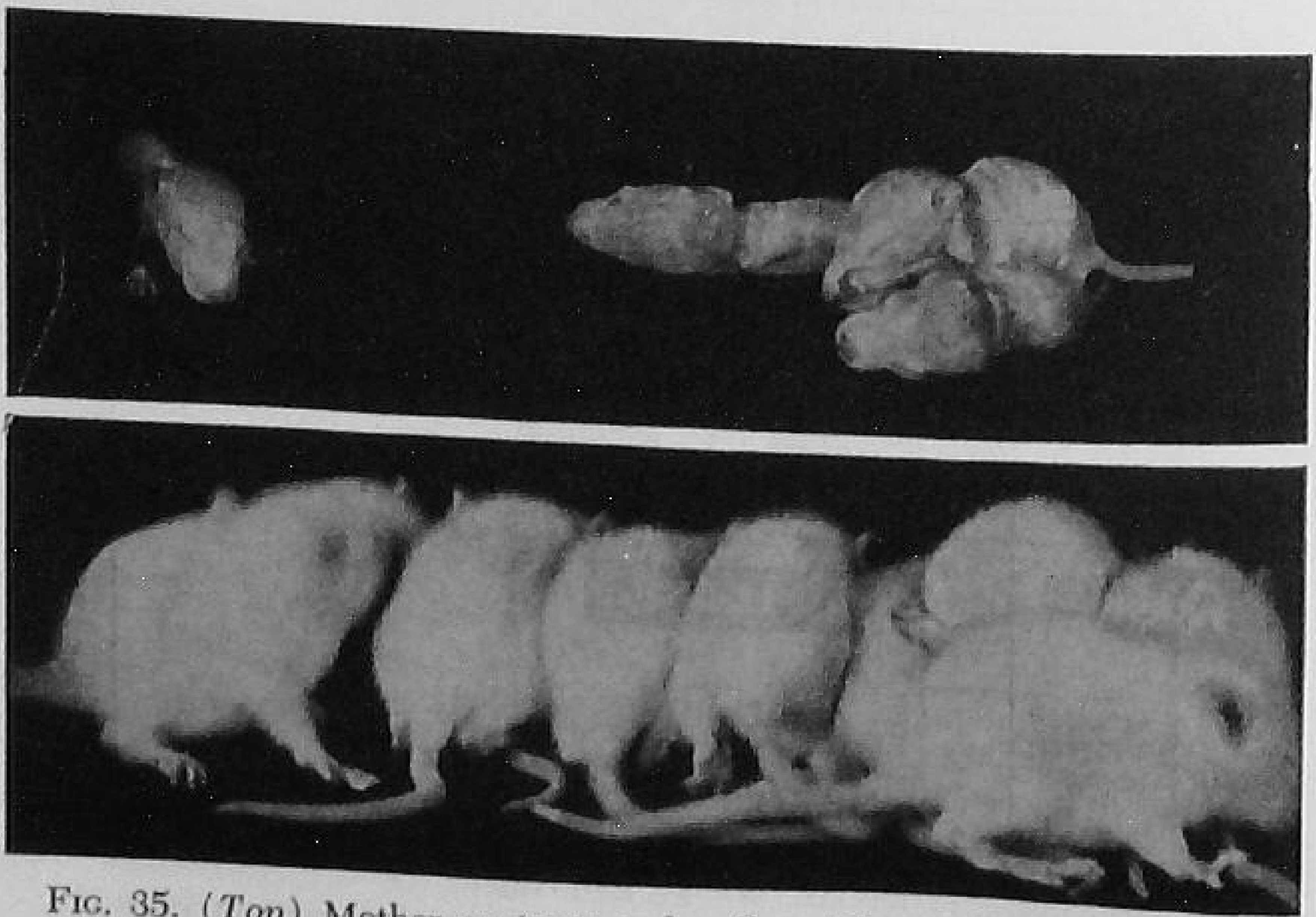


FIG. 35. (*Top*) Mother on toast and coffee. (*Bottom*) Mother on cow's milk. The diet of the human mother may affect markedly the growth and the survival of the nursing young, as it did here in the case of the rats.

Sample Menu for a Day for a Lactating Mother[17]

Breakfast

Stewed prunes
Shredded-wheat cereal with milk (sugar if desired)
Scrambled eggs
Toast with butter or fortified margarine
Milk or coffee (or both)

Midmorning Lunch

Milk

Noon Meal

Tomato juice
Baked ham
Scalloped potatoes
Green beans
Raw carrot sticks
Whole-wheat bread and butter or fortified margarine
Cup custard
Milk and coffee or tea (if desired)

Midafternoon Lunch

Orange or grapefruit juice

Supper or Luncheon

Cream of pea soup
Tomato and cottage cheese salad
Biscuit with butter or fortified margarine
Apple sauce
Gingerbread
Milk and coffee or tea (if desired)

Before Retiring

A glass of milk

[17] Adaptation from Federal Security Agency, Children's Bureau: The Child 9:169-171, 1945.

DIET AFTER DELIVERY

A liquid diet usually is given for the first meal after delivery. After that, there is a return to the normal diet. When the mother nurses the baby there must be an even greater allowance of food than there was during pregnancy.

DIET DURING LACTATION

Lactation makes even greater demands in some respects upon the maternal organism than does pregnancy. The child after birth still must be fed from the mother's body, the food now being produced by the mammary glands instead of being supplied through the blood stream as before birth. As the baby gains in weight and becomes increasingly active, the food supply from the mother must increase.

Supply of Mother's Milk. A normal infant will consume daily 2½ ounces of mother's milk for each pound of his weight. An 8-pound infant will consume approximately 20 ounces, while a 15-pound baby will consume about 30 ounces. Since human milk has a caloric value of 20 calories per ounce, it will be seen readily that a nursing mother must supply several hundred additional calories per day as food for the infant.

Dietary Requirements. The nursing woman of sedentary habits will require approximately 1,000 additional calories above her normal needs, not only for milk production, but also for the extra activity necessitated by the care of the baby. Besides the increase in energy requirement, there are also increases in the requirements of protein, minerals and vitamins. These needs may be met by the consumption of larger quantities of the same foods used during pregnancy. Milk should be increased to 1½ quarts, and there

should be larger servings of meat and other protein foods and additional servings of fruits and vegetables. Some source of vitamin D may be included at the direction of the physician. Fried foods and foods rich in fat generally should be avoided, as should highly seasoned foods such as sausage and pickles. Sometimes foods high in fiber must be avoided. Highly flavored vegetables and dried beans, except in soup form, may also cause disturbances.

Between-meal feedings are often advisable during lactation, and plenty of water as well as other liquids should be taken. A typical sample menu for a day is shown on page 165.

It should be remembered that the mother must return to a normal food intake when she weans the baby from the breast, or she will gain excess weight.

STATISTICS

Although statistics for the past 20 years show a significant reduction in maternal and infant mortality, much remains to be done, particularly in nutritional care. Better nutrition before conception, as well as during the prenatal period, will not only help to reduce this mortality further but ensure better health for mother and infant than our studies indicate now exists.

STUDY QUESTIONS

1. Even the normal healthy woman who has been taking an adequate diet will require more dietary essentials during pregnancy. Review "Recommended Dietary Allowances of the Food and Nutrition Board of the National Research Council" for women in various activities. Which allowances increase in ratio to the caloric allowance? What other essentials should be increased during pregnancy?

2. What do nutrition studies show of the adequacy of diets in pregnancy of large groups of women in the United States? What is the role of the nurse in the correction of this situation?

3. Discuss the results of an inadequate intake of protein. In what forms may extra protein be added to the diet?

4. The mineral requirement is naturally larger during pregnancy. How may the calcium and the phosphorus requirements be fulfilled? What are the food sources of iron? How may the iodine requirement be fulfilled?

5. List the foods and the quantity of each that must be included daily in the diet of the pregnant woman.

6. The principles of food selection during pregnancy are the same as for an adequate diet for normal needs. Plan a menu for a day for a healthy pregnant woman of average weight. Make necessary modifications for a woman who is underweight. For one who is overweight.

7. During the first trimester there may be trouble with nausea. How may the menu be modified to relieve this?

8. If for any reason the quota of fluid milk cannot be taken each day, how may milk be used otherwise in the diet? Suggest appetizing, easily digested dishes which may be used in the menu.

9. During the latter part of the second trimester, the pressure of the enlarged uterus may cause intestinal

stasis. In this event what measures should be taken? Why should a liberal amount of fluid be taken throughout pregnancy?

10. During the third trimester, toxemia may appear. Is there anything to indicate that diet may act as a preventive? If so, state the evidence.

11. Lactation makes greater demands upon the mother than does pregnancy. What food increases should be made to stimulate the supply of milk? What foods may cause digestive disturbances? Plan a menu differing in content from the sample menu on page 165 but as adequate to it in every respect.

CHAPTER THIRTEEN

Nutrition During Infancy

INTRODUCTION
BREAST FEEDING
FORMULA FEEDING
ILLNESSES OF INFANCY
WEANING
FEEDING PREMATURE INFANTS
DETERMINING THE FORMULA
NUTRITIONAL NEEDS TO BE MET BY THE FORMULA
HOW TO MAKE THE FORMULA
SUPPLEMENTARY FOODS
DEVELOPMENTAL GROWTH
WEIGHT AS A DIETARY INDICATOR

INTRODUCTION

There are many evidences that the earliest experiences of the newborn baby are of great importance in his later adjustment to the world in which he must live. Whether a baby is breast- or formula-fed is of less importance than the spirit in which he is given his food.[1] If the mother is relaxed and confident, the baby will respond to her and, through her, to the world about him with trust and confidence. Conversely, if the mother is tense and overanxious, if the feeding is hurried, the baby becomes aware of discomfort. In response, there may be fretfulness or crying, which may prevent his taking the food he needs.

A mother should be encouraged to breast-feed her baby, but she should not be made to feel guilty if she prefers to bottle-feed him. If he is cuddled and made comfortable when he is being fed, whether by breast or by bottle, his feelings will be those of warmth and comfort, and he will be able to establish warm, comfortable relationships with those about him.

[1] Federal Security Agency, Children's Bureau: Infant Care, Publication No. 8, 1951.

BREAST FEEDING

Breast feeding is the natural way to feed the baby, and it is thought to be of advantage to start the baby out this way. It is easy for the mother, for she does not have to worry over making the formula. Moreover, breast-fed babies are less likely to be constipated. If the mother is breast-feeding her baby, however, she must be sure to have a proper diet (see Chap. 12) and sufficient sleep and relaxation. Otherwise her body will not produce enough milk. The following table shows the approximate quantity of milk consumed by an average baby under normal conditions. It will be seen how necessary it is for the mother to eat properly if she is going to produce this quantity of milk:

	Gm.	Oz.
1st day	10	⅓
2d day	90	3
3d day	190	6⅓
4th day	310	10
5th day	350	11½
6th day	390	13
7th day	470	15⅔
3d week	500	16
4th week	600	20
8th week	800	26½
12th week	900	30
24th week	1,000	33

The thick, yellowish fluid which appears the first few days of nursing is called colostrum. It will nourish the baby until the milk comes a few days later. The baby should be laid beside the mother with his cheek close to her breast. He will turn his head toward the breast trying to find the nipple, and the mother can help him by holding the nipple so that he can get it into his mouth. Nursing the baby will in itself increase the milk supply of the mother, and she will be able to satisfy his needs with an ever-increasing supply as he keeps on growing. At first the baby may be satisfied after he has emptied only one breast, but if he does not give signs that he is full, he should be given the other breast. He should be started on this breast at his next feeding, so as to be sure to empty it.

If the baby is not getting enough to satisfy his hunger from the breast feeding, the doctor may prescribe an additional formula for him, to be given after he has been at the breast. For one reason or another, the mother may wish occasionally to skip a breast feeding, and in such case a formula feeding may be substituted.

In some circumstances it may be advisable to substitute bottle feeding for breast feeding, even when the mother has an adequate supply of milk. According to the Children's Bureau,[2] "Bottle feeding is sometimes necessary because of an illness in the mother that would make breast feeding dangerous either to the baby or to her."

"Burping" the Baby

Once or twice during a feeding, the baby should be given a chance to bring up any swallowed air. Holding him up so that his stomach is against the mother's shoulder and gently patting him on the back will help to eliminate the air.

How Often to Feed

Much has been said in recent years about so-called "self-demand schedules of feeding." For many years babies were fed by the clock regardless of whether they were hungry earlier or later than the scheduled time. Today we recognize that when a baby is hungry, that is the time to feed him, whether the interval is 2, 3, 4 or even 5 hours. A newborn baby may wake to be fed 10 or 12 times in 24 hours. By the time he is a month old, there may be 3 hours between feedings. Most babies establish themselves on a schedule of 4-hourly feedings by the time they are between 2 and 3 months old. During this time, too, the baby will begin to sleep through the night after a late evening feeding.

FORMULA FEEDING

If the mother is feeding her baby by bottle, she should hold him as though she were breast-feeding him,

[2] *Ibid.*

in order to give him the same sense of nearness and companionship. It is important that she feel relaxed and unhurried, and that she enjoy this time with her baby. She should never allow him to eat by himself by propping the bottle up beside him. In this way his nutritional needs will be met but not his need for love and contact.

Self-regulation of feeding is important for the formula-fed baby, too. At first the mother may have to be prepared to make up 10 or 12 bottles of formula, but, like the breast-fed baby, he will set his own schedule within the first 2 or 3 months. It should be noted that it is not safe to reheat a formula that is left over.

Weight Gain. It is beginning to be recognized that each baby will establish his own rate of weight gain, quite independent of so-called "averages." As long as he continues to gain weight, and does not indicate by crying after his feeding that he is hungry or by refusing part of the formula that he is getting too much, it can be assumed that he is getting the right amount of food. (For average weights see the height-weight charts, Table 12, Part Four.)

ILLNESSES OF INFANCY

Colic. Colic is caused by cramps in the intestines, which cause the baby real pain and discomfort. It may occur when the baby is cold or tired or excited, but it may occur sometimes without any apparent reason. Fortunately, after 3 or 4 months of age, most babies do not have colic.

Constipation. A breast-fed baby is almost never constipated. A formula-fed baby will have fewer stools than a breast-fed baby, perhaps one a day or even less. As long as the movement is soft, there is no cause for worry. If the stool becomes hard, the doctor may make a slight change in the formula.

Diarrhea. Loose stools may be serious, and the doctor should be consulted at once. See Chapter 33 for diseases in which diarrhea is a symptom.

WEANING

The average breast-fed baby is weaned between the sixth and the ninth months. He has been drinking water and perhaps orange juice from the bottle or from a cup, and many other foods have been added to his diet. He may have become accustomed to the bottle by the supplement to the breast feeding which was necessary. Some pediatricians recommend the supplementary feeding even when the mother has enough milk, in order to accustom the baby to bottle feeding.

A bottle-fed baby is not ready to change to cup feeding as early as a breast-fed baby. However, some of the formula milk may be given in a cup as early as the fifth or the sixth month in order to accustom the baby to its use. At first he will take only a few sips, and he should be allowed to have most of his fluids by way of the bottle. When he begins to take a good deal of milk from a cup, his formula feedings may be cut accordingly.

THE FEEDING OF PREMATURE INFANTS

The premature infant needs more care in every respect than does a full-term baby. The sucking and the swallowing reflexes may be absent or sluggish, the capacity of the stom-

COMPOSITION OF MILK MIXTURES FOR FEEDING PREMATURE INFANTS DESIGNED TO PROVIDE 120–130 CALORIES PER KG. OF BODY WEIGHT*

(Compiled in co-operation with Harry H. Gordon, M.D.)

MILK MIXTURE[1] (PER KG.)	PROTEIN		FAT		CARBOHYDRATE		CALORIES	
	Gm.	Per Cent of calories	Gm.	Per Cent of calories	Gm.	Per Cent of calories	Total	Per cc.
For smaller premature infants—less than 2,000 Gm. (4 lbs. 7 ozs.):								
Half-skimmed milk, 150 cc., plus sugar, 15 Gm. (approximately 10 per cent added)	5.3	16	2.6	18	21.8	66	132	0.9
Half-skimmed milk, powdered, 18 Gm., plus sugar, 11 Gm., plus water to make total of 150 cc.	6.0	20	2.2	16	19.4	64	121	.8
For larger, more mature infants—2,000–2,500 Gm. (4 lbs. 7 ozs.–5 lbs. 8 ozs.):								
Evaporated milk, 70 cc., plus sugar, 6 Gm., plus water to make total of 150 cc.	4.8	16	5.5	41	12.9	43	120	.8
Human milk, 180 cc.	2.2	7	6.7	50	12.9	43	121	.7

[1] Acidification of milk with lactic acid is recommended for premature infants by some authorities. Theoretically it would be indicated because of the tendency for these infants to have low gastric acidity. Practically, lactic-acid milk has the advantage of keeping for 24 hours without refrigeration.

* Adapted from Premature Infants, A Manual for Physicians, by Ethel C. Dunham, M.D., Children's Bureau Publication No. 325, 1948.

INITIAL FEEDINGS EVERY 3 HOURS FOR INFANT OF 1,500 GM.*

(Gordon)

AGE	5% GLUCOSE (cc. per feeding)	WATER (cc. per feeding)	FEEDING MIXTURE (cc. per feeding)	TOTAL FLUID (cc. per Kg. 24 hrs.)	TOTAL CALORIES (per Kg. 24 hrs.)
0–12 hrs.	0	0	0	20[1]	(1)
12–24 hrs.	8	0	0		
24–36 hrs.	8	0	4	75	30
36–48 hrs.	8	0	8		
3, 4, 5 days	0	8	12–16	105–135	50–70
6, 7 days	0	5	20–25	135–160	85–105
8 days	0	0	30	160	125

[1] During the first 24 hours no particular attention need be paid the total fluid or the total caloric requirement.

* From Premature Infants, A Manual for Physicians, by Ethel C. Dunham, M.D., Children's Bureau Publication No. 325, 1948.

ach is small, the gastric acidity is low, the absorption of fat is poor, and the digestive enzyme system is incompletely developed. Human milk was long considered the ideal food for premature infants and, in fact, essential for their proper nutrition. Recent work indicates, however, that a high-protein, low-fat cow's-milk formula will ensure better weight gain and development in these infants than does human milk.

Because of the incomplete antenatal storage and the demands of rapid growth, the premature infant has greater need of calcium and phosphorus than has the full-term infant. Cow's milk has a much higher calcium content than human milk, and this calcium seems to be more readily absorbed. This is another reason for favoring cow's milk for premature infants. Iron storage is usually incomplete, and it may be necessary to give either an iron medication or a blood transfusion to prevent the development of an iron-deficient anemia.

There is greater need for vitamins in the premature than in the full-term infant. The amount of milk actually taken may be very small and will not supply sufficient of the vitamins usually found in milk for the needs of the rapidly growing premature infant. Moreover, low-fat cow's milk will contain less vitamin A than full cow's milk. Defective fat absorption will interfere with the absorption of vitamins A and D. Therefore, these two vitamins will have to be added in larger amounts than usual, and in concentrate form miscible in water. Vitamin C also needs to be supplied to premature as well as to full-term infants. Usually, the synthetic form is given until the baby has gained full-term status, when orange juice may be substituted. There is some indication that supplements of the B-complex vitamins are also desirable.

Because the sucking or swallowing reflexes may be sluggish, a very small premature infant may be fed entirely by gavage until he is capable of taking a formula. A somewhat larger baby may be fed with a medicine dropper covered with rubber tubing until he is able to suck. As soon as premature infants are found to suck well, they should be fed by bottle.

DETERMINING THE FORMULA

Milks Used in Infant Feeding. Cow's milk usually is chosen because it can be modified easily to resemble the composition of human milk, and a safe supply is generally available. Fresh pasteurized, canned evaporated or dried whole milk powder may be used in the preparation of a formula.

The choice of the type of milk for infant feeding will be determined by circumstances. Sometimes a safe, dependable fresh milk supply is not available, or home refrigeration is inadequate. Evaporated milk is distributed widely and will keep without refrigeration until the can is opened, after which it must be stored in a cold place, as is the case with fresh milk. Dried milk also will keep without refrigeration until the can is opened, but it must be kept covered and cold afterward. Some physicians prescribe canned milk for the formula, even when a supply of fresh milk is available, as they consider it more satisfactory. It is

possible to obtain each of these milks fortified with vitamin D.

In processing canned and dried whole milk, the fat is blended thoroughly with the other milk solids. When fresh whole milk is used for the formula, the physician may advise the use of the homogenized type, in which, during the process of preparation for the market, the cream is thoroughly blended and distributed throughout the milk.

Special Forms of Milk. Under some conditions a pediatrician may advise the use of a lactic-acid milk. This may be obtained in dried form or it may be prepared either by adding lactic acid or a culture to cool boiled milk. Cooling is important before the acid is added; otherwise, the curds are too large to pass easily through the nipple. Occasionally orange or lemon juice is used instead of lactic acid. Temporary changes from the usual formula, such as reduction of fat by the use of partially skimmed milk, may be advised. Naturally, changes of this kind are made under supervision of the physician.

Goat's milk is used sometimes in infant feeding when there is an allergy to cow's milk. As will be seen by the following table of percentage composition, it must be prepared for infant use in much the same fashion as cow's milk.

	Cow's Milk Per Cent	Goat's Milk Per Cent	Human Milk Per Cent
Protein	3.5	3.3	1.4
Fat	3.9	4.2	3.7
Carbohydrate	4.9	4.8	7.2
Minerals	0.7	0.7	0.2
Water	87.0	87.0	87.5

Milk Substitutes. Certain infants are born with a sensitivity to the proteins of all milk. This may be mild enough to cause only irritability, or it may be severe enough to cause violent illness and even death. Several preparations have been devised as foods to approximate human milk in carbohydrate, protein, fat, minerals, and vitamins. These contain no milk at all. Soybean preparations are most commonly used. The protein in the soybean usually can be taken by infants allergic to the proteins of milk. If these types of "milk" are properly supplemented, infants do as well on them as on other bottle feedings.

Sugars Used in Formula Making. Cow's milk is adapted to the needs of an animal that reaches maturity in a few months, while the human offspring does not reach maturity for some years. It is to be expected, therefore, that cow's milk will be richer in body-building materials. By analysis, it is found to be richer in protein and in the mineral salts and somewhat richer in fat but less rich in milk sugar. For this reason it is commonly "modified" by dilution with water and the addition of some form of sugar. This may be granulated sugar (sucrose), corn syrup or malt sugar (dextrimaltose). Physicians differ as to the choice of carbohydrate, but sugar and corn syrup are most often used because they can be found at the grocery store and are easy to use. The amount to be added is calculated according to the total number of calories required for 24 hours. The milk used in the day's formula will

supply most of the calories, the difference being made up by the addition of carbohydrate. Then water will be added to meet the fluid requirement and for the dilution of the protein.

Nutritional Needs to Be Met by the Formula

The protein requirement for children is much higher per kilogram of body weight than for adults, because of the added needs for growth. Whereas the adult requirement is 1 gram of protein per kilogram, the infant will need from 2 to 3 grams of human milk protein or from 3 to 4 grams of cow's milk protein per kilogram of body weight. The difference is due to the fact that the amino acids of human milk protein are more closely adapted for human infant needs than are those of cow's milk protein.

The energy requirement of infants likewise is much greater per unit of body weight than that of adults. The adult need for energy for a moderately active person is met by approximately 40 calories per kilogram of body weight in 24 hours. The very young infant needs 120 calories per kilogram of body weight in 24 hours, three times the requirement of the adult. The reason for this is that the infant has more active tissue and a greater body surface area for his weight than the adult; consequently, there is a greater heat loss. Additional calories are also needed for growth and activity. The table on this page will show the distribution of these caloric needs of the infant.

	Calories/Kg./ of Body Weight/24 Hrs.
Basal metabolism	60
Activity	25
Growth	30
Loss in stools	5
Total	120

The fluid requirement for young infants is about 150 cc., or 5 ounces, per kilogram of body weight in 24 hours. At first this usually is calculated into the formula, but later boiled water is given to the baby between his feedings.

Calculation of a Formula. We shall assume that we have a 3-month-old baby weighing 5 kilograms, or 11 pounds, who is to be transferred from breast to bottle feeding. His needs will be as follows:

5 x 120 calories = 600 calories
5 x 3 to 4 Gm. protein = 15 to 20 Gm. protein.
5 x 150 cc. fluid = 750 cc. fluid, or 25 ozs.

If we look up the protein content of milk, we shall find that it contains 3½ Gm. of protein and 70 calories per 100 cc. Therefore, if we use 600 cc., or 20 ozs., of milk, we shall obtain 21 Gm. of protein and 420 calories. The protein is slightly higher than the required amount of 15 to 20 Gm., but this is acceptable for the fast-growing infant. Since we need a total of 600 calories, we will need 45 Gm. of sugar, which at 4 calories per gram will yield the remaining 180 calories. Water (150 cc., or 5 ozs.) will be added to bring the total fluid up to 750 cc. At three months, this probably would be given in five

feedings of 150 cc., or 5 ozs., each feeding.

The amount of formula for the baby will be increased gradually, first by the week and then by the month, throughout the period of bottle feeding. To meet the special needs the doctor may change the formula in the first weeks; then it probably will be standardized, except for an increase in quantity.

The lower infant mortality rate and the larger number of well babies are attributed in large part to the great advances made in the last decades in methods of feeding, especially among infants who must be fed artificially. The simplification of the formula and the early supplementation of milk with other foods deserve much credit. However, Mitchell[3] states: "Perhaps the most significant improvement in artificial feeding of infants is the reduction of bacterial contamination. Sterilization of the formula at the time of preparation and the subsequent storage of it so that bacterial contamination is avoided have been major factors in reduction of morbidity and mortality of gastro-intestinal infections during the first era of life."

How to Make the Formula

The technic of the preparation of the formula for the artificially fed infant is a matter on which the young mother should be instructed carefully. The procedure will depend to some extent upon whether the milk is in fresh, canned or dried form. In every case, however, the cleanliness of bottles, nipples and utensils used during the making of the formula must be stressed. The care of the filled bottles for the 24-hour allowance, which is usually made up at one time, is the same, whatever type of milk is used.

A set of utensils[4] should be reserved, if possible, especially for preparing the formula. These should include:

A wire rack, or a pie tin (upside down) that fits the bottom of the kettle, for holding the bottles.

A bottle brush with a long handle and with stout bristles to scrub the inside of the bottles. It should be one that is bent at the tip so that the bristles clean the bottom of the bottle and not just the sides.

A set of measuring spoons.

A measuring cup, marked in ounces, with a pouring lip.

A large saucepan to mix the formula in, with a lip to make pouring easy. Get at least a 2-quart size.

A small saucepan with a lid, in which to boil and keep the nipples. (If you use Method II.)

A funnel makes it easier to pour the formula into the nursing bottles, but if your saucepan has a lip that pours well you may be able to get along without one. If you get a plastic one, make sure it is the kind which can be boiled.

A long-handled spoon.

A can opener that punches holes (if you use canned milk).

A small wide-mouthed jar with a cover, for used nipples.

Bottles to hold a 24-hour supply of formula.

Nipples and nipple caps.

A pair of tongs is convenient.

Bottles should be of heat-resisting glass, if possible, and there

[3] Mitchell and Nelson: Textbook of Pediatrics, ed. 5, Philadelphia, Saunders. 1950.

[4] Federal Security Agency, Children's Bureau: Infant Care, Publication No. 8, 1951.

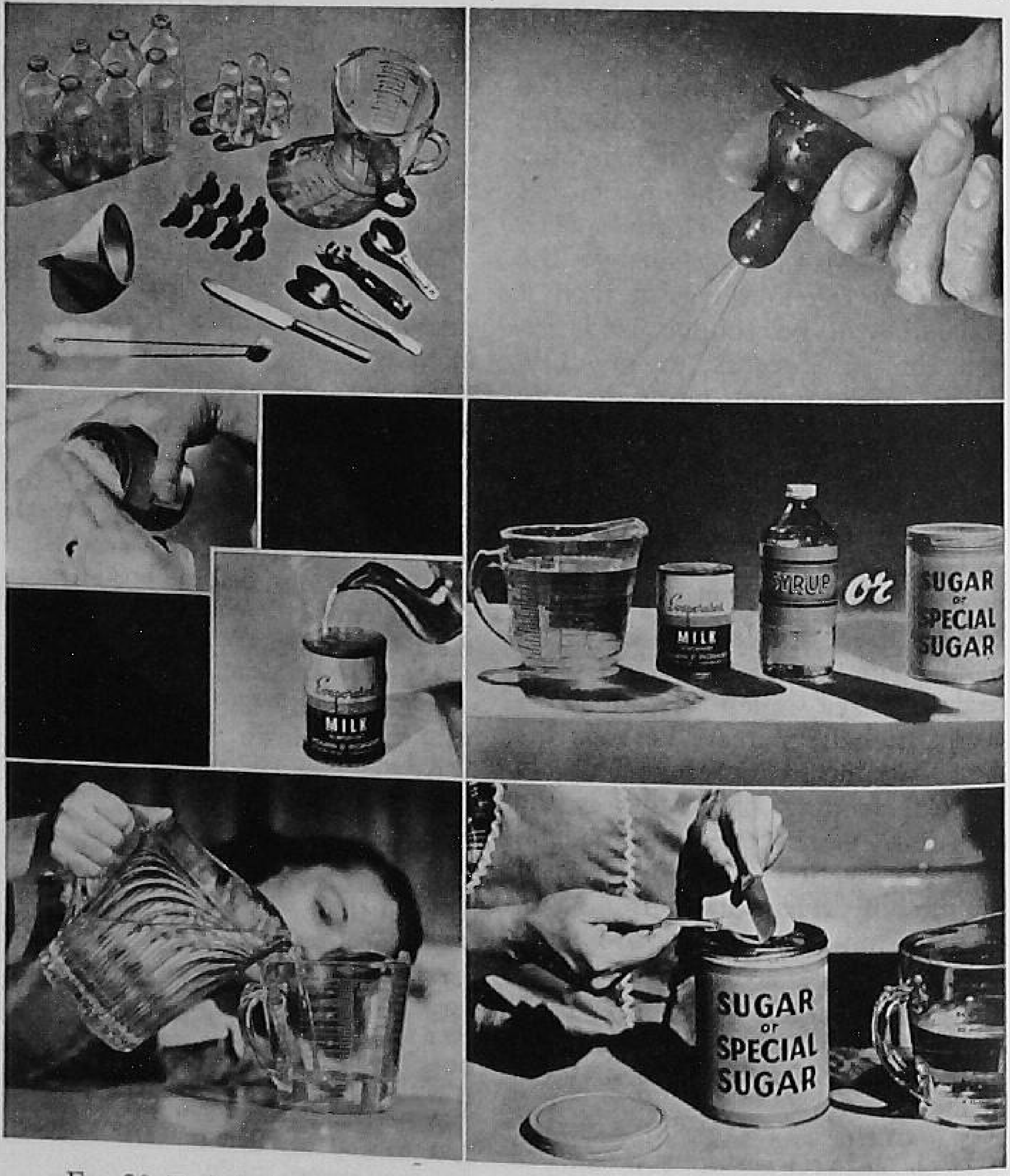


Fig. 36. Technic for preparing the formula. (*Top, left*) Equipment needed. (*Top, right*) Testing nipple after washing. (*Center, left*) Scalding can. (*Center, right*) Ingredients for formula (*Bottom, left*) Measuring water. (*Bottom, right*) Measuring sugar.

should be a bottle for every feeding. Extra bottles are convenient. There should be bottle caps in the same number. Nipple caps may be of plastic, aluminum or paper. The last are inexpensive but can be used only once. More nipples than caps will be needed, as they will be used when giving the baby water and orange juice. Bottles and nipples should be rinsed after each feeding, scrubbed with soapy water inside

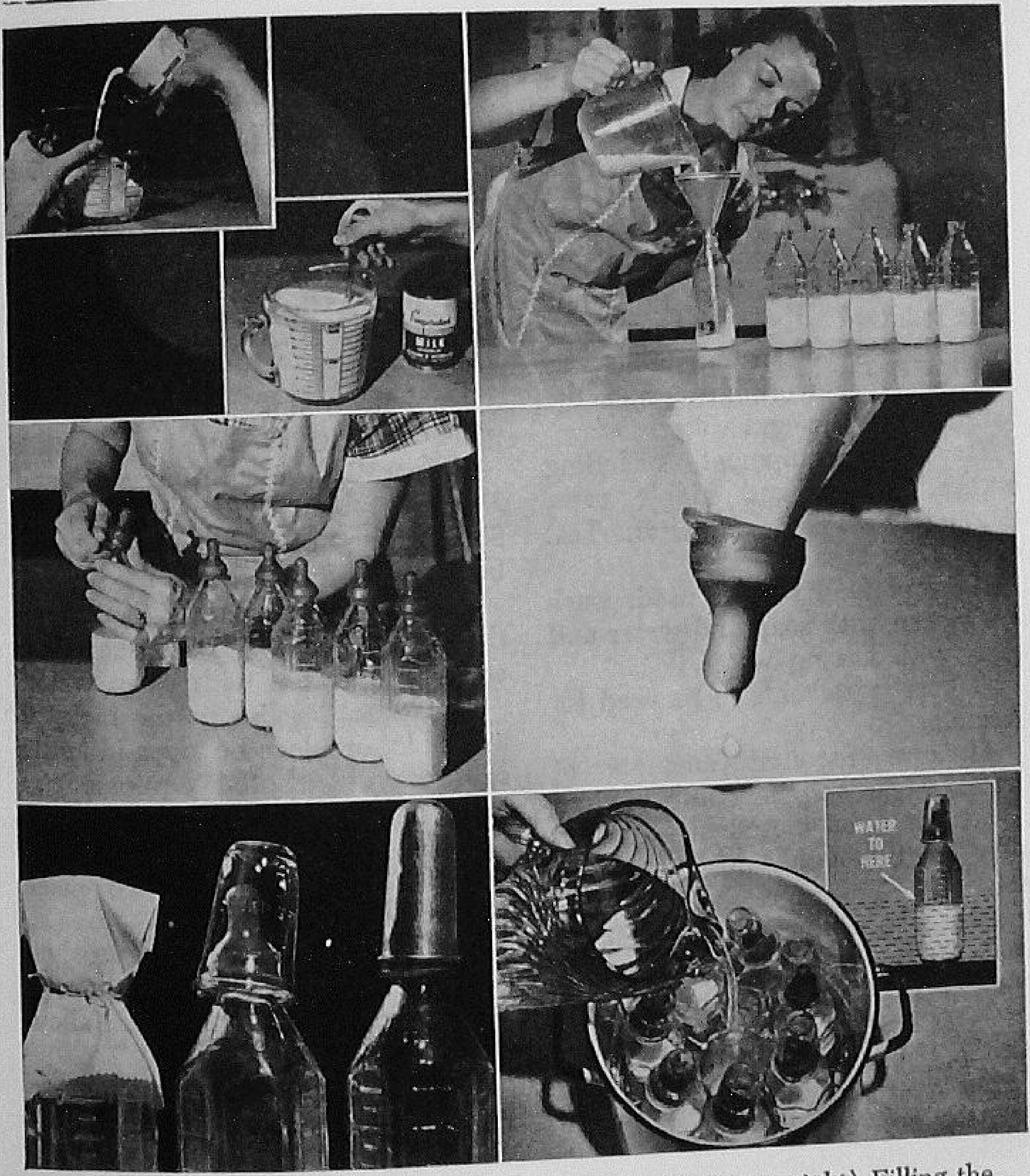


Fig. 36 (*continued*). (*Top, left*) Measuring milk. (*Top, right*) Filling the bottles. (*Center, left*) Putting on nipples. (*Center, right*) Testing nipple for flow. (*Bottom, left*) Paper, glass and aluminum caps. (*Bottom, right*) Bottles on rack, ready for sterilization.

and out, then rinsed thoroughly with warm clean water. The hole in the nipple should be tested by forcing water through it to be sure that it is not clogged, so that there may be a good flow of milk or other liquid when it is used.

Terminal Sterilization of the Formula. This method was developed in the past few years and is suitable for most formulas, except those which would be altered by the application of heat after preparation, such as lactic-acid milk formulas.

Its great advantage is its ease of use and the elimination of possibilities for contamination of the formula. The method is recommended by the American Hospital Association and is required by law in all hospitals in the state of New York. There are many advantages for home use also. The procedure is as follows:

Thoroughly clean the table surface or other work area, and the hands with soap and water.

Have all equipment, including bottles, nipples and nipple caps, thoroughly washed and clean. Test nipples for flow.

If evaporated milk is used, wash top of can with soap and water and rinse with boiling water.

Collect ingredients to be used for formula.

Measure required amounts of water, sugar and milk into pitcher.

Stir or beat ingredients so that they are thoroughly mixed and dissolved.

Pour the required amount of formula into each bottle, using the funnel. If a small amount of formula is left, add a little to each bottle.

Put a nipple on each bottle and test the flow of milk.

Cover the nipples loosely with the nipple caps, no matter what type of bottle and cap is used.

Put the bottles into a deep kettle, in a bottle rack, or on an inverted pie plate, and arrange a towel around the bottles to prevent tipping and spilling.

Fill the kettle with cold water to the halfway mark on the bottles.

Cover the kettle with its cover, if the kettle is deep enough, or invert another kettle of the same size over it, in order to make a steam sterilizer.

Bring water to a boil and allow to boil *gently* for 25 minutes.

Remove kettle from fire and allow to cool without removing lid. When cool enough to handle, remove bottles from kettle and tighten nipple caps. (Slow cooling will prevent the formation of a scum and consequent nipple clogging.)

Cool to room temperature and place in refrigerator.

Preparation of Equipment and Formula Using Sterile Technic. Sterilization of equipment should be done as follows:

All equipment should have been thoroughly washed with soap and water and rinsed with clean water.

Place bottles in bottle rack, if available, or place on sides in kettle or dishpan. Add other equipment to be used in the preparation of the formula. Place nipples and caps in jar with perforated top and place upside down in kettle.

Add water to cover, bring to boil and boil vigorously for 5 minutes.

Remove rack of bottles and allow to drain.

With long-handled spoon remove jar of nipples and allow to drain.

Leave remaining utensils in kettle until ready to use.

The procedure for the preparation of fresh milk, evaporated milk and dried milk formulas is given in the table on page 179. Use the sterile equipment prepared above, being careful not to contaminate it.

Warming the Feeding. The following procedure should be observed:

Remove filled nursing bottle from refrigerator.

Formula Preparation with Sterile Technic

Fresh Milk	Evaporated Milk	Dried Milk
Take bottle of milk from the refrigerator Wash top under running water and wipe with towel (unless there is an extra protecting bottle cap) Shake bottle and measure required amount of milk into saucepan Measure and add required amount of water Measure and add required amount of sugar or syrup into mixture and stir Bring to boil and boil 5 minutes, stirring constantly	Measure required amount of water into saucepan Add required amount of sugar or syrup Stir until dissolved Bring to boil, boil 5 minutes and remove from heat Scald top of can of evaporated milk by dipping it into boiling water, or pouring boiling water over it Open can of milk, measure required amount into saucepan with other ingredients Stir to mix	Measure required amount of cold water and place in saucepan Add required amount of dried milk to water. (Use dry measuring spoon and level with knife) Beat with egg beater until milk and water are blended thoroughly Measure required amount of sugar into mixture and stir Bring to boil and let boil 5 minutes while stirring constantly

Strain and pour at once through funnel into sterilized bottles. (If bottles are not heat-proof, cool mixture by placing the saucepan into a pan of cold water and stirring.) Cover bottles with sterilized caps and place at once in refrigerator. (Sterilized nipples may be placed on the bottles before they are covered with the caps.)

Place in small, deep saucepan of warm water or in bottle-warmer.

Place over high heat until water begins to bubble.

Shake bottle occasionally so that milk will warm evenly.

Remove bottle cap and put on nipple taken from covered jar, unless nipple was placed on bottle when formula was prepared. Be sure not to contaminate the rim of the bottle or the nipple.

Test temperature of milk by shaking a few drops on the inside of the wrist. Milk should be warm but not hot.

SUPPLEMENTARY FOODS

In an excellent article on the developmental growth of children, Rabinovitch[5] states: "Babies differ a great deal in their capacity to handle new foods, and many difficult situations have been created by a rigid adherence to a preconceived schedule. There is no set time for the introduction of orange juice or solid food, and one is always wiser to respect the infant's developmental pace and to allow him to set the pattern."

In the following paragraphs, the

[5] Rabinovitch, R. D., and Fischhoff, J.: J. Am. Dietet. A. 28:614, 1952.

authors have indicated the approximate age at which new foods may be introduced, but in the light of the above paragraph it can be seen that there may be a considerable variation with different infants.

Vitamin Supplements. Both breast-fed and artificially fed infants may need vitamin supplements as early as the second to the fourth week.

Fish-liver oil is one of the oldest and best-known sources of vitamins A and D. Jeans and Rand[6] advise that 15 drops once or twice daily may be given at the end of the first month and gradually increased until one teaspoonful is being taken each day throughout the period of infancy. Some other authorities advocate larger quantities. There is wide variation as to the amount of vitamin D in various oils; hence, the quantity should depend upon the strength: 400 I.U. is the dosage recommended by the Food and Nutrition Board of the National Research Council.[7] When a lower fat intake is desirable, fish-liver oils which have a higher vitamin potency than cod-liver oil may be prescribed, a smaller quantity of oil, of course, being used.

By the time the child is 3 or 4 weeks of age, orange juice is added to supply vitamin C. It should be diluted at first with an equal quantity of cool, boiled water and given once a day, beginning with one teaspoonful and gradually increasing this amount to two tablespoonfuls, twice daily, by the end of the third month. Tomato juice may be substituted for the orange juice, but it is not more than half as potent a source of vitamin C. It does not need to be diluted. Mothers should be warned that orange or tomato juice must not be heated or boiled, or the vitamin C will be destroyed. The great caution necessary for the preparation of a formula is due to the fact that milk is a good culture medium for bacteria.

If the baby is allergic to orange juice, or if there is considerable difficulty in getting him to take it, the synthetic vitamin ascorbic acid may be substituted.

Cereals. The baby should be introduced to cereals when he is about 3 months old. Dry-cereal preparations and canned cereals especially prepared for infant feeding are available. Because milk is low in some of the essential nutritional factors, many doctors advise the use of fortified cereals to supplement milk, so that the increasing needs of the growing infant may be met adequately.

The dry products must be mixed with warm formula or whole milk, while the others need only be warmed. The cereals generally used by the family may be cooked according to the directions given on the package and used for the baby. Some physicians advise longer cooking. The coarse cereals must be strained, and all of them should be thinner than those prepared for the family. Only a small amount of cereal should be used at first, and this usually is given just before a midmorning feeding. The original small amount may be increased

[6] Jeans, P. C., and Rand, M.: Essentials of Pediatrics, Philadelphia, Lippincott, 1946.

[7] National Research Council: Recommended Dietary Allowances No. 129, 1948.

gradually, and in a few months it may be of a thicker consistency. By the seventh or the eighth month, the baby will be taking from 2 to 5 tablespoonfuls twice during the day.

Egg Yolk. There is some difference of opinion among pediatricians as to when egg yolk should be added to the baby's diet. Some advise it as early as the second month, others later. One drop of egg yolk should be given the first day, two drops the second, and so on until the eleventh day, when 11 drops are given. If this is well tolerated, the infant may be given half an egg yolk. The reason for this gradual introduction of the egg yolk is to develop tolerance in those infants who are sensitive to the protein of egg yolk. The egg white is not given because the additional protein is unnecessary and the child may be sensitive to it. The egg yolk may be soft-cooked, it may be poached, or it may be the tender yolk of a hard-cooked egg. It is advisable to serve the egg yolk in small amounts until the end of the first six months. At most, not more than one yolk a day should be given. In addition to good protein, the egg yolk is a valuable contributor of iron.

Vegetables. By the fourth month, or even earlier, vegetables should be introduced. Strained vegetables, fresh or canned, should be used, starting with 1 teaspoonful and gradually increasing to 4 tablespoonfuls or more by the time the child is 8 months old. Some babies will become accustomed to eating vegetables more quickly than others, with whom the introduction must be very gradual. Vegetables should be cooked according to directions in Chapter 45, Vegetables, and put

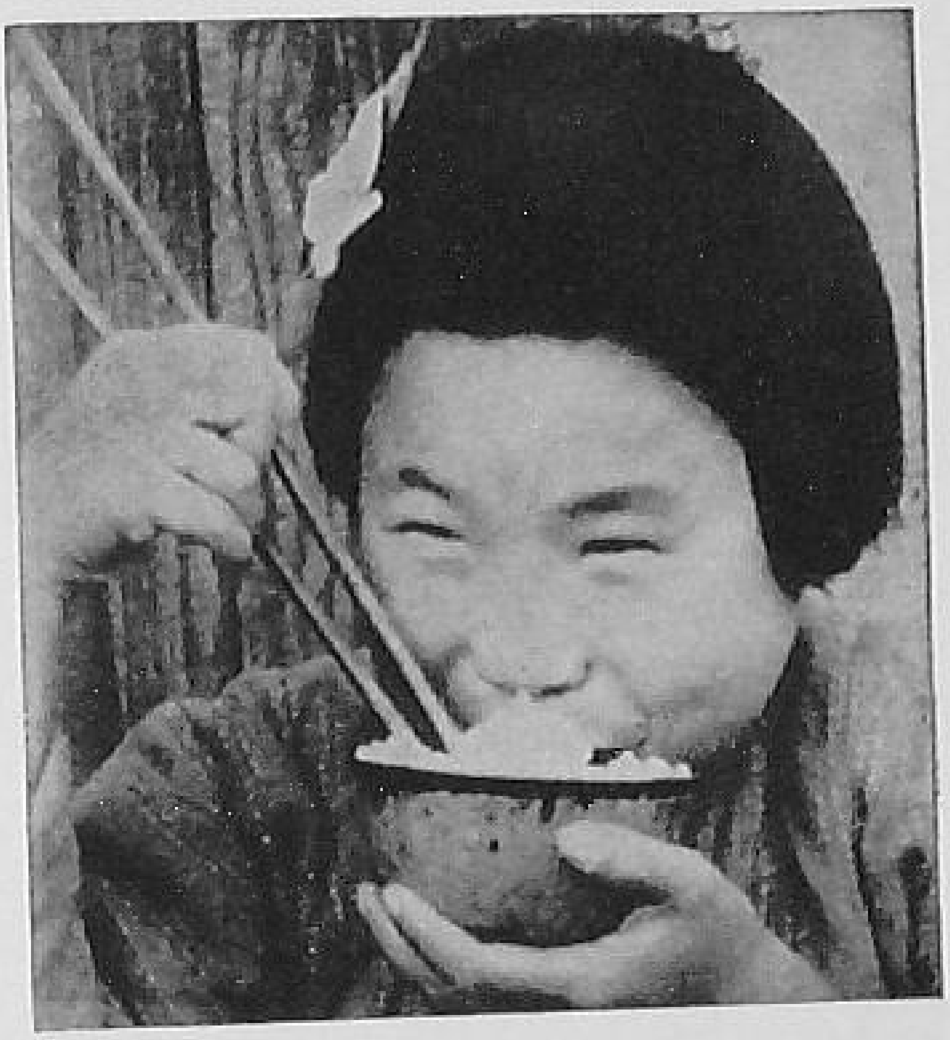


Fig. 37 A. Familiar foods give other nationalities. (FAO, from a feeling of security to children of UN film, "Battle for Bread")

through a purée sieve or strainer, unless a canned ready-to-use product is chosen. Canned purées come in many varieties and they are most convenient to use. Green, leafy vegetables, including any mild-flavored green, as well as spinach, should be given several times a week on alternate days. Almost any vegetable which comes in canned puréed form or a fresh or canned vegetable which can be sieved easily may be used. Usually, choice can be governed by what vegetable is to be served on the family table. Potatoes can be taken well, but they should replace cereal occasionally rather than another vegetable. For the first year, vegetables are not buttered, but they may be seasoned with a small amount of salt. Toward the end of the year, chopped vegetables may replace strained vegetables. Some pediatricians advise their use earlier

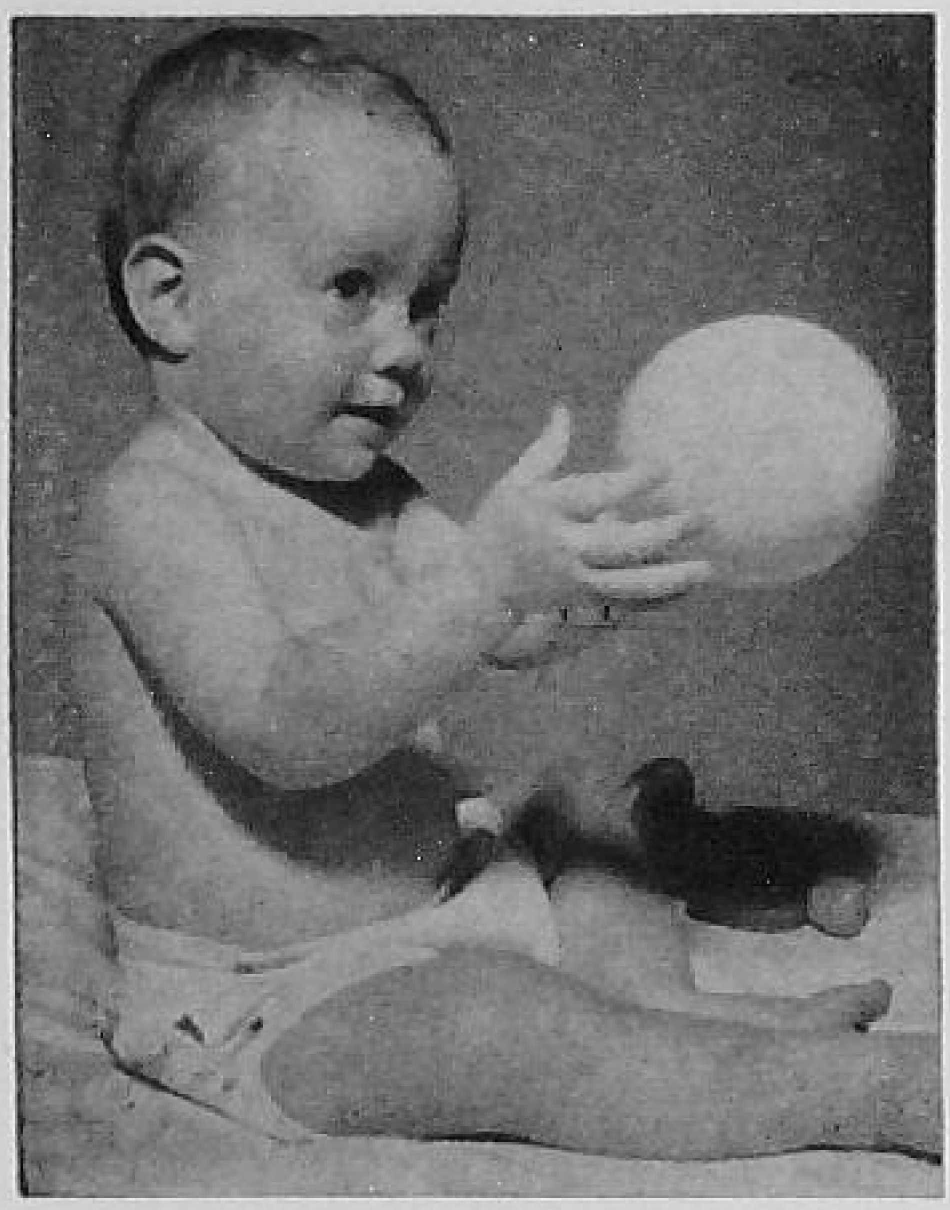


FIG. 37 B. Signs of good nutrition. Note the straight back, well-developed body, alertness and good co-ordination of this child.

than do others. Some children can take them earlier than others without digestive disturbances.

Fruits. By the fourth to the sixth month, in addition to orange and tomato juices, applesauce, mashed banana, apricot or prune purée and other puréed cooked fruits may be added.

Meat. Scraped lean meat or liver is introduced into the baby's diet at about 6 months in modern pediatric practice. Both meats may be cooked with only enough water to prevent sticking. Canned puréed and chopped meats, ready to use, are now available and convenient. They are low in fat content and seasoned only with salt and are recommended when the family meat is not suitable for the baby.

Bread. Dried bread or zwieback should be given the baby after his first teeth have come through, as these hard foods are an aid in teaching him to chew properly. The sliced bread should be dried slowly in the oven so that it is crisp throughout. An enriched white bread or a whole-grain bread, but not a coarse bread, should be chosen.

DEVELOPMENTAL GROWTH

As the baby becomes acquainted with a variety of things, including his food, he will want to explore it with such tools as he has at his command. To quote Rabinovitch[8] again: "In the second half of the first year, the baby will begin to mess with food, to feel its texture and consistency, to finger-feed himself as he recognizes his growing dexterity. Such experimentation, often difficult for the cleanliness-and-germ-conscious mother is essential for the child as he learns to relate to food by messing, smelling and pouring. That a high degree of parental fortitude is necessary to allow for these developmental realities goes without saying."

WEIGHT AS A DIETARY INDICATOR

The height-weight tables in Part Four will be found useful as a means of comparison in determining average normal gains and as a basis for computing nutritional requirements. It needs to be pointed out again that a well baby will set his own rate of gain regardless of any so-called "average" tables.

When the child is not making a steady gain, something is wrong. He

[8] *Op. cit.*

should gain, during the first six months, from 4 to 8 ounces per week, with an average gain of about 6 ounces. Many babies double their weight in 5 months.

During the second half of the first year the weight gain will be slower, but most babies will have trebled their birth weight at the end of the first year. The rate of gain will vary with the size of the parents, the sex of the baby—boys are a little heavier than girls—and the type of body build of the child.

STUDY QUESTIONS

1. Why is breast feeding considered to be an advantage for both the mother and the baby?

2. What must the mother's attitude be if she bottle-feeds the baby?

3. In what circumstances should breast feeding be discontinued?

4. If breast milk decreases in quantity, what method is used to supplement it?

5. What foods in what quantity should be included in the mother's diet if she is nursing her baby?

6. The average baby is weaned between the sixth and the ninth months. What preparations should be made for it?

7. The premature infant needs more care than does a full-term baby. What precautions must be taken? How does his feeding schedule differ from that of a normal baby?

8. Cow's milk is generally used in artificial feeding. How does it compare with human milk? What forms of cow's milk may be used, and what are the reasons which may influence the choice?

9. In preparing the milk formula, there must be dilution and additions. For what reasons? What are the additions generally used?

10. Babies are quite individual in their growth rates. What warning should be given the mother about height and weight tables?

11. What is meant by self-demand feeding? Why have many doctors advised against a too-rigid feeding schedule?

12. Plan a formula and a feeding schedule for a baby 5 months old and weighing 14 lbs. (6½ Kg.).

13. Terminal sterilization is coming into general use. What are its advantages? For which type of formula can it not be used? Give directions for preparing a whole-milk formula when making use of terminal sterilization.

14. Give directions for making an evaporated milk formula, using sterile technic. What are the difficulties of this method of formula preparation?

15. The choice of the type of milk may depend upon circumstances. What type of milk would you suggest for a young mother traveling with a baby across the United States? Why?

16. Supplementary foods are introduced into the baby's diet gradually. What is the first supplement generally advised and in what amount? In what order are other supplements introduced? Suggest reasons for their introduction. Plan a day's diet for a normal well baby 9 months of age.

17. How does the baby's growing dexterity and his need for exploration affect his food habits at this particular age?

CHAPTER FOURTEEN

Nutrition for Growth

INTRODUCTION
DIET IN EARLY CHILDHOOD
ELEMENTARY SCHOOL AGE
HIGH SCHOOL AGE
NUTRITION STUDIES OF CHILDREN
THE SCHOOL LUNCH PROGRAM
NUTRITION EDUCATION
EVALUATION OF GROWTH AND NUTRITIONAL STATUS

INTRODUCTION

The influence of nutrition on the health, the growth and the development of the newborn baby and of the infant has been shown in previous chapters. Here we shall consider the nutritional needs of children and show how nutrition modifies growth and development and is, in turn, modified by environment.

Just as improvement in infant feeding practices has done much to promote the health of babies and to lower infant mortality, so our knowledge of nutrition has contributed toward the health and the well-being of all children. Studies made of 9-year-old boys show that in the past 50 years in this age group there has been an increase of from 3 to 4 inches in height and of from 5 to 8 pounds in weight.[1] Since good nutrition, as expressed by growth, should affect the whole development of the child and be the foundation of good health in the adult, it can be seen that such increases in growth and weight may contribute to the well-being of the individual for the rest of his life.

Growth and Development. By growth we usually mean a physical increase in weight or height, or both. It is the result of cell multiplication. Development is more difficult to describe and to measure: it deals with muscle strength and co-ordination, with mental capacity and mental health, with attitudes and adaptations. Nutrition not only affects growth, but it may directly or indirectly influence the development of the child. Other factors which affect the child and which, therefore, are interrelated with nutrition are the emotional, the economic, the social and the hereditary environment in which he finds himself.

Rates of Growth. Although growth occurs continuously from conception to full maturity, it is not a uniform process but consists of two periods of rapid growth separated by one of more or less uniform but slower increase. The first period occurs in fetal life and early infancy, the second during adolescence. The nutrition needs during the first period have been discussed in earlier chap-

[1] From data collected by Boyd, J. D.: The Child **16**:58, 1951.

ters. We shall now go on to consider the needs of children following the period of infancy, when the growth curve slows down to a steady pace until the second period of rapid growth is reached in adolescence.

DIET IN EARLY CHILDHOOD (Preschool Age)

The diet of the 1 year old differs only slightly from that described in the previous chapter. It will include approximately ¾ of a quart of milk per day and the supplementary foods previously described. He will have been introduced to the family 3-meal-a-day schedule with a midmorning and a midafternoon lunch of fruit juice. The bottle usually will have been supplanted by the cup and the spoon.

During the second year more solid foods will be added: for example, finely chopped vegetables and fruits in place of strained products; ready-to-eat cereals, as well as hot cereals; chopped liver, lean meat, fish and poultry in small quantities daily. Eggs will be used frequently. Cottage cheese and mild American cheese in combination with other foods may be used occasionally; custard and simple puddings are served, and butter or margarine fortified with vitamin A is used with toast or zwieback. The child's food should be prepared simply, and most fried foods, rich pastries and cakes should be avoided. Coffee, tea or soft drinks containing caffeine should not be offered to young children.

In the preschool period the basis of the diet should remain the same, but the child should be introduced gradually to most of the foods on the family table. He should not be encouraged to drink more than ¾ of a quart of milk a day, so that his appetite for other foods may not be lost. If he eats well of the other foods offered at his meal, this amount of milk will be enough for his needs. Some of this may be used in cream soups and custards or other desserts included in his meals. Whole fruits and vegetables, both cooked and raw, should begin to appear on his menu. Meat should be cut in small pieces rather than ground. Bacon, if it has not been used earlier, is often a welcome addition. It needs to be remembered that at this age a child will often gladly eat such foods as raw carrots and lettuce with his fingers but refuse them if he has to use a fork or spoon, because the food is too difficult to manage with them.

A midmorning and a midafternoon lunch should continue to be planned for this age group of children if it does not interfere with the child's appetite at mealtime. Milk, if not consumed at mealtime, or fruit juice, sometimes accompanied by bread, crackers or plain cookies, may be given. Rich cookies, cake and candy should not be eaten between meals but reserved, if used at all, for dessert at the end of a meal.

Establishing Good Food Habits

It is extremely important that the child's training to establish good food habits be begun during the first year and continued through childhood. The meal hour should be one of peace and quiet. For this reason children sometimes are served apart from the older members of the family. Tension and unpleasantness during the meal hour will often destroy the child's appetite and quite fre-

FOODS INCLUDED IN A GOOD DAILY DIET
FOR CHILDREN FROM 1 TO 6*[2]

Food	Amount Needed by Each Child Daily	Average Size of Serving for Each Age		
		1 Year Old	2 and 3 Years Old	4 and 5 Years Old
Milk	3 to 4 measuring cups	1 cup as a drink at each meal		
Eggs	1 egg	1 whole egg		
Meat, poultry or fish	½ to 2 ozs. (2 to 4 tbsp.)	½ oz. (2 tbsp.)	1½ ozs. (3 tbsp.)	2 ozs. (4 tbsp.)
Dried beans, peas, lentils	1 serving 2 or 3 times a week when meats and eggs are hard to get	Strained in soup	3 tbsp.	4 tbsp.
Potatoes	1 serving	2 tbsp.	3 tbsp.	4 tbsp.
Other cooked vegetables (a green leafy or deep-yellow vegetable often)	1 to 2 servings	2 tbsp.	3 tbsp.	4 tbsp.
Raw vegetables (lettuce, carrots, celery, tomatoes, etc.)	Small amount	....	A small piece or two	
Fruit for vitamin C	1 medium-sized orange or ½ to ¾ cup tomato juice	Whole day's amount in one serving		
Other fruit (apple, banana, peaches, prunes)	1 to 2 servings	¼ c.	⅓ c.	½ c.
Cereal, whole-grain, restored or enriched	1 serving	¼ c.	⅓ c.	½ c.
Bread, whole-grain or enriched	1½ to 5 slices	½ to 1 slice	1 to 1½ slices	1½ to 2 slices
Butter or fortified margarine	1 to 2 tbsp.	1 teasp.	1 to 3 teasp.	1 to 3 teasp.
Sweets	A simple dessert at 1 or 2 meals	¼ c.	⅓ c.	½ c.
Fish-liver oil	Enough to provide 400 to 800 U.S.P. units of vitamin D			

* All measurements in this chart are level, measuring cups and measuring spoons being used.
[2] Your Child from One to Six. Federal Security Agency, Children's Bureau, Publication No. 30, 1945.

quently cause indigestion. The meal hour should be one of the pleasant occasions of the day. It gives the mother an opportunity both to visit with her child and to teach him respect for good food and desirable habits of eating (manners as well as food tastes).

The child whose appetite is meager will best be served by having one dish at a time placed before him rather than the whole meal. The child has a "single-track" mind and should not have his interest in one food distracted by others, especially when the others are more attractive or alluring. Children usually prefer to take one food at a time rather than to mix them. The foods should be served in courses, each one being a surprise. Children are great imitators; they often partake of food simply because "Daddy" or "Mother" does. Therefore, parents should set a good example by including in their own diet foods known to be essential for good body-building. Unfavorable comments regarding wholesome foods should be strictly avoided.

A mother is often overly anxious about her child's food and displays this anxiety before him. A child's appetite may vary, as does that of an adult. Because he does not drink his full quota of milk at one meal does not mean that the lack will not be made up at the next one. There is much virtue in expecting the child to eat the things set before him. A child who is scolded and made to feel that he is being coerced into eating certain foods is sure not to want them and more than likely will fight for his "rights." Undue nagging is responsible for many of the so-called food-problem children.

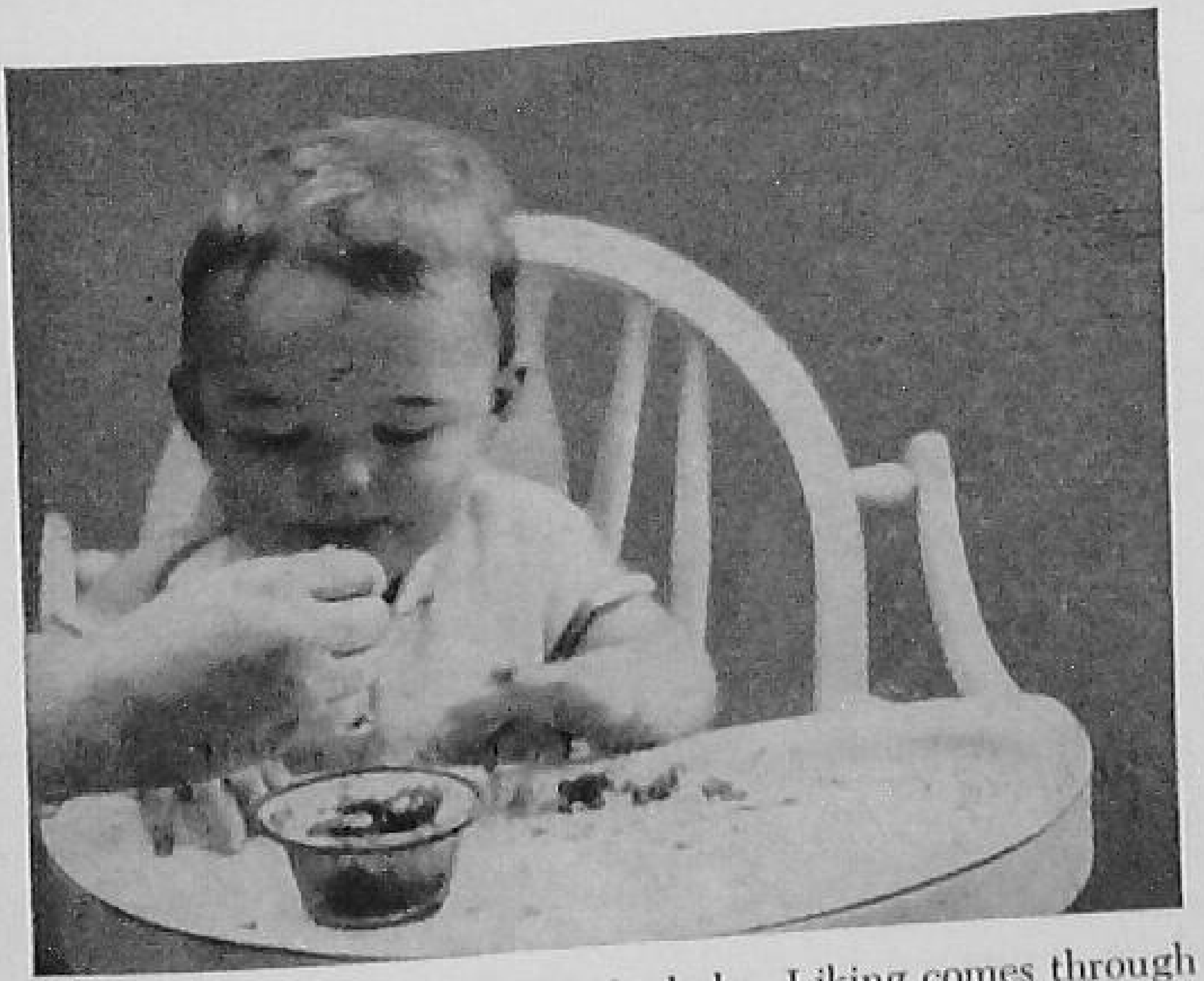


FIG. 38. The right start for the baby. Liking comes through learning to like. Teach the flavor of a variety of foods early. (Gesell and Ilg: Feeding Behavior of Infants)

If a child is to be offered some unfamiliar food, this should come at the early part of the meal while he is still hungry, and the food should be given in very small quantity. If he rejects it, he should not be forced but should have another trial a week later.

Bribery is usually bad psychology since a child soon learns to classify food unpleasantly, as with medicine. Tactfulness on the part of the mother is never more necessary than at a child's mealtime. As already stated, the most effective plan is to expect the child to eat the food set before him. Mothers who carry through successful food programs must have faith in their ultimate success.

Children differ greatly in their natural desire for food. Long-term studies such as those conducted at the Yale Clinic of Child Development emphasize that fact and also that appetite runs in cycles. A complete summary of eating behavior of children at different age levels from 1 to 10 is given by Gesell and Ilg.[3] Notable in this summary are the "refusals and preferences" which should be familiar to every mother, nurse or dietitian dealing with children. For instance, "finicky" food habits and food jags are characteristic in the years from 2 to 4. The 5- to 7-year-olds dislike casserole dishes, mixtures, fat meats and gravies. They like raw vegetables better than cooked ones, but dislike strongly flavored cooked vegetables, the root vegetables especially being in disfavor.

Preferences also change with age and should be respected by mother or nurse. Nutritional requirements can be met in spite of this changing pattern with age. The 5-year-old prefers plain food, such as meats, potatoes, raw vegetables, milk and fruit. By 6 or 7 he is willing to try new foods and to accept previously disliked foods. By 8 there is a ravenous appetite with few refusals but strong preferences. Food may be judged by odor or color, and food served attractively makes an impression. By 9, the child usually has a keen interest in food, likes to help prepare it and is positive in his likes and dislikes. Some will eat everything at this age, but plain foods still are preferred. Puréed foods and fat on meat continue to be disliked. The authors particularly stress the deep-seated growth reasons which seem to underlie these changing preferences and refusals.

[3] Gesell and Ilg: The Child from Five to Ten, New York, Harper, 1946.

ELEMENTARY SCHOOL AGE

New problems with regard to the regular routine of feeding which has been established in the first years may occur when the child enters elementary school. Contact with other children who have been allowed a greater variety of food and are accustomed to eating sweets between meals may cause a child to question his own schedule, which he has taken for granted. The excitement of new experiences may interfere at times with digestion and appetite, especially if a fear of being late is developed. It is important that there should be plenty of time for the eating of an adequate breakfast. This is true for lunch also when there are two school sessions and the child comes home for this meal. If he takes lunch to school and there are

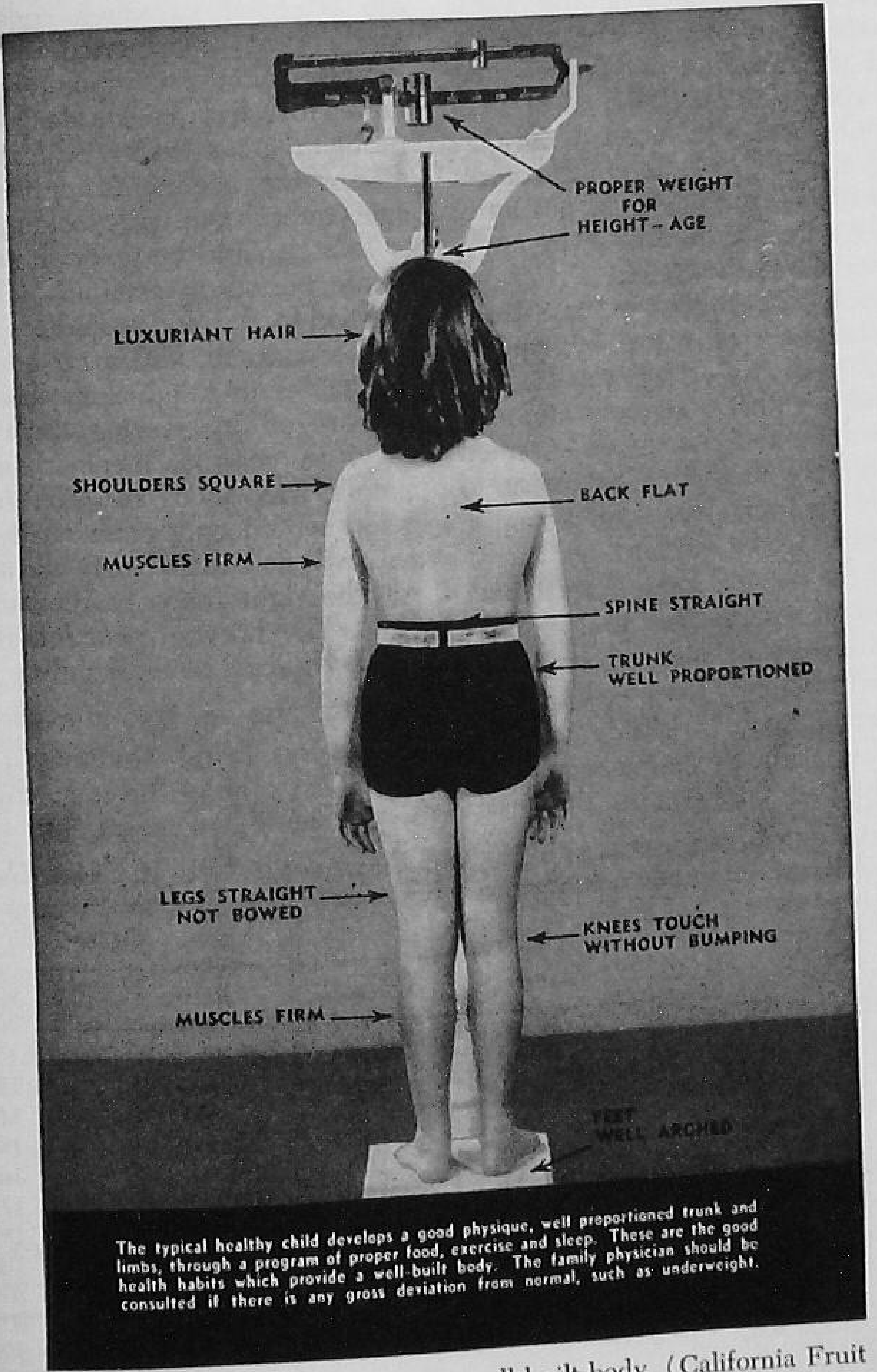


FIG. 39. Healthy child, showing a well-built body. (California Fruit Growers' Exchange)

no provisions for a hot meal, the box lunch which he carries should be planned to supplement the home breakfast and dinner. The evening-meal plan for the child must take into consideration the type of mid-day meal which he has had. He may need a light lunch after he returns from school, but it should not be of such a nature as to take away appetite for the early dinner.

Gesell and Ilg[4] state that there is usually a steady rise in appetite from 5 years on—"By 9 years nearly all children have a vigorous and generous appetite." They call attention to the fact that it is not wise to expect uniform levels of appetite, however, throughout the day. "Breakfast is the poorest meal; even though one might wish to insist that it might be otherwise. At many ages there is marked variability from meal to meal. But again, such variability tends to decrease with increasing age." The authors call attention to the inadvisability of overstressing the development of good table manners which are often of so much concern to mothers at this period. "From a developmental standpoint graceful table manners constitute a minor problem. . . . Under ordinary conditions the 'manners' improve with age (rather than with scoldings)."

Effort should be made during this whole period to establish taste for all good food. Food prejudices should be discouraged, and a taste for raw vegetables in salad form should be encouraged by serving them regularly. In general, meals should be simple, fried foods and rich desserts being served only occasionally. Parents will find that if they themselves eat the right foods regularly, there is less likelihood of poor food habits in the children of the family.

Nutritional Requirements

Calories. Beal,[5] studying a considerable group of the same children over a period of years, has shown

Caloric Consumption by Boys and Girls from 1 to 10 Years Old

Age	Boys		Girls	
	Range	*Mean*	*Range*	*Mean*
	Cal.	Cal.	Cal.	Cal
One	1017–1431	1224	996–1452	1224
Two	1154–1682	1418	1159–1719	1439
Three	1255–1829	1542	1294–1888	1591
Four	1317–1973	1645	1334–1984	1659
Five	1508–2176	1842	1368–2080	1724
Six	1590–2274	1932	1526–2268	1897
Seven	1653–2399	2026	1583–2389	1986
Eight	1751–2589	2170	1661–2433	2047
Nine	1843–2847	2345	1719–2479	2099
Ten	1864–2792	2328	1706–2486	2096

[4] *Ibid.*

[5] Beal, V. A., Burke, B. S., and Stuart, H. C.: Nutrition studies on children living at home, Am. J. Dis. Child. **70**:214, 1945.

that there is little difference between the caloric intake of boys and girls up to 5 years of age. After this the boys have a consistently higher caloric intake than girls. Her findings are shown on the preceding page.

The Basic Seven foods should be the first source of calories. They should be supplemented by additional bread and potatoes and desserts, and occasionally by other sweets, to meet the total caloric needs.

Calories must be supplied in adequate quantity in the diet if growth is to occur. When the caloric intake is below the needed requirement of the child, protein foods will be used for energy instead of for tissue building. Macy and Hunscher[6] have shown recently that "a difference in intake of as few as ten calories per kilogram of body weight per day (or approximately four calories per pound) may make the difference between progress and failure in satisfactory growth."

Protein. Protein needs increase with growth, and protein intake will increase with increased caloric intake if a variety of foods is eaten. A quart of milk a day, from 4 to 7 eggs a week and a serving of meat, fish or chicken daily will meet the protein needs adequately. If, however, the calories are obtained largely from carbohydrates, including candy and soft drinks in excess, both the quantity and the quality of the protein intake will suffer.

Calcium and Iron. A quart of milk daily will provide the necessary calcium as well as good quality protein and certain essential vitamins. Iron needs are met by an adequate intake of meat, eggs, green leafy vegetables, whole-grain and enriched breads and cereals and potatoes. Dried peas and beans and molasses will contribute a share of iron if these foods form a staple article of the diet.

Vitamins. Vitamin needs are more likely to be met when a variety of foods is included in the diet. Milk, butter, fortified margarine and green and yellow vegetables and fruits will provide vitamin A. The continued use of fish-liver oils is recommended for school-age children to ensure good bone and tooth development. Milk fortified with vitamin D will ensure some intake of this vitamin. The B complex vitamins will be included if good quality protein foods, as well as enriched bread and cereals, appear frequently in the diet. In our Southern states, where cornmeal rather than wheat flour is commonly used, it is important to obtain enriched cornmeal when this is possible. Vitamin C needs are not met as easily as other nutritional requirements, as the food sources are limited in number. Citrus fruits and tomatoes are excellent sources, but not available in some communities except during the growing season. Potatoes are a good, cheap source of this vitamin, but they are not a staple article of diet in some of our regional and national dietary patterns. Cabbage and other leafy vegetables, particularly when served raw, will contribute some of this vitamin to the diet whenever these foods are served. The following are the foods which should appear daily in the diet of school-age children.

[6] Macy, I. G., and Hunscher, H. A.: J. Nutrition **45**:189, 1951.

Daily Food Needs of the 6 to 12 Year Old[7]

Each of the seven groups which follow should be included in every day's meals.

Group 1

Dark green, leafy and deep yellow vegetables:

Such as broccoli, kale, green peppers, turnip and other greens, carrots, sweet potatoes, winter squash.

Raw, cooked, frozen, canned.

One or more servings daily.

Group 2

Citrus fruit, tomatoes, raw cabbage and other high vitamin C foods:

Such as oranges, grapefruit, lemons, limes, tomatoes, muskmelons, fresh pineapples, strawberries; raw cabbage, green peppers and turnips. (If fruits are hard to get, use more, especially raw, from Groups 1 and 3.)

One or more servings daily.

Group 3

Potatoes and other vegetables and fruit:

Such as potatoes, beets, celery, corn, eggplant, lettuce, mushrooms, rutabagas, summer squash; apples, apricots, peaches, pears, rhubarb, prunes, raisins, dates, figs and other fruits and berries.

Raw, cooked, frozen, canned, dried.

Two or more servings daily.

Group 4

Milk, cheese, ice cream.

Milk—whole, skim, evaporated, condensed, dried, buttermilk.

Three to four cups daily.

The following portions contain as much calcium as a cup of milk: 1 oz. cheddar cheese, 4 ozs. cream cheese, 12 ozs. cottage cheese, 2 or 3 large dips of ice cream.

Group 5

Meat, fish, poultry, eggs, dried beans and peas, nuts.

One serving of meat or fish daily if possible.

Four or more eggs a week.

Two or more servings a week of nuts, peanut butter or dried peas or beans.

Group 6

Bread and cereals.

Whole-grain or enriched and restored every day.

Group 7

Butter or fortified margarine daily.

Energy foods (such as rice, jams and jellies, cakes, candy, bacon and salad oils) may be used in addition to the Seven Basic foods, but should not be used in place of them.

[7] Your Child from 6 to 12. Children's Bureau, Federal Security Agency, 1949.

HIGH SCHOOL AGE

It is during adolescence that the second very rapid growth period occurs. This is usually between the ages of 12 and 14 for girls and 14 and 16 for boys, although it may be sooner for early-maturing children and somewhat later for late-maturing children. Physical growth occurs in all directions, in length of bones, in muscle mass, in laying down of body fat in the soft tissues, and in the widening of the shoulders in boys and the broadening of the hips in girls. The total period of rapid growth seldom lasts more than two or three years, when adult build and stature are reached. Growth in skeletal muscle mass continues, however, particularly in the boy. A further "lengthening out" may occur in the late adolescent period in both boys and girls.

As may be expected, the nutritional needs to be met by this rapid growth process are increased tremendously. Stuart, in an article dealing with physical growth during adolescence, says:[8] "Food requirements are extremely high during pubescence. Fortunately the appetite is usually voracious, so that enough suitable food will be eaten if it is made available. However, unsuitable foods will satisfy the appetite, and faulty habits of food selection formed in earlier years will often be carried over into this period and prevent the taking of an adequate diet. The principal need is for a high protein diet, covered by a liberal allowance of calories."

During this period of rapid physical growth, there is a concurrent maturing of the whole personality, with its attendant strains and stresses. There is a striving for independence from parental restriction, coupled with an increased need for guidance and reassurance. The adolescent must be given the opportunity to make his own decisions, and parents must be understanding of this urge for independence, yet be willing to help when asked. At this time coffee and tea may begin to appear in the diet as an indication of being "grown up." There is no harm in this if the intake is not excessive, and if it is not substituted for milk. The habits of the parents in this, as in many other matters, are often the deciding factor, as the child patterns himself on the adults he knows best.

Girls are apt to attempt to reduce or to keep thin at this time. Again, there is no great harm in this as long as the essential foods to meet the nutritional needs are included in the diet. Unfortunately, it is often milk (see middle section of chart on page 195), eggs, vegetables, bread and potatoes that are omitted and candy and other sweets that are substituted, illogical as this may seem. Such food habits impair growth and health and reduce resistance to disease. Although there has been a steady decrease in the incidence of tuberculosis over many years, the incidence in young women between 15 and 24 years of age has increased. Physicians are inclined to attribute this to the fad of slenderizing.

Besides adequate protein and calories, girls need an increased iron intake when menses begin. An adequate amount of foods high in iron, such as lean meats, liver, eggs, green, leafy vegetables, enriched breads

[8] Stuart, H. C.: Am. J. Dis. Child. 74:495, 1947.

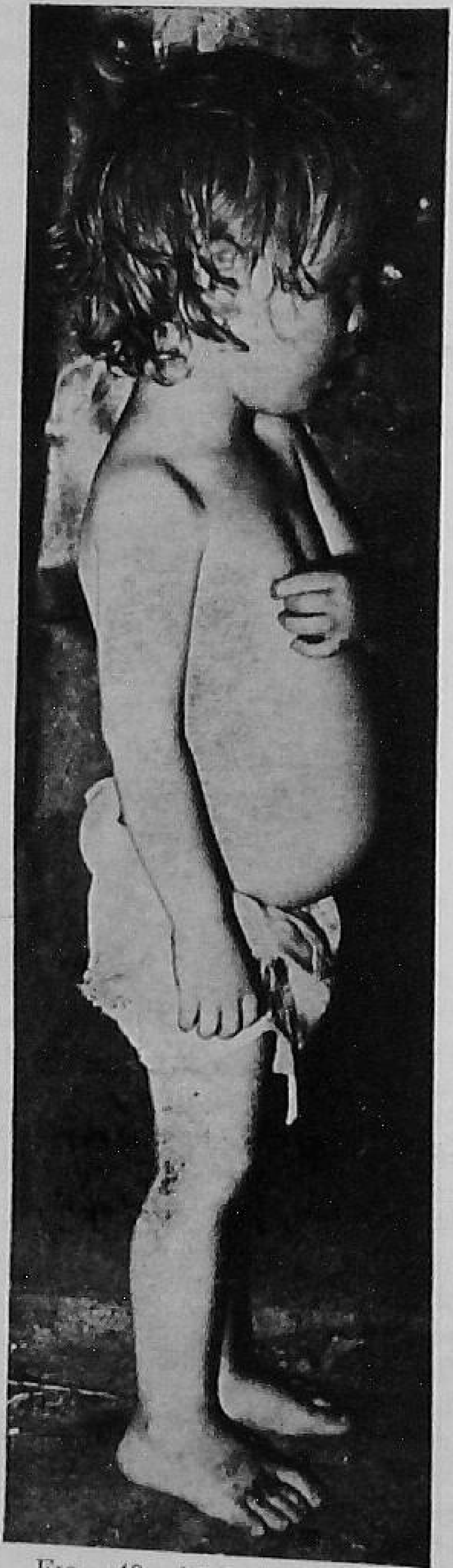


FIG. 40. Malnutrition in a young child. (Farm Security Agency)

and cereals and potatoes, should be included in the daily food intake. This is a period when the young girl, beginning to look forward to eventual marriage and motherhood, may be taught in school and in such groups as the Girl Scouts that good nutrition is an important factor in the bearing of healthy babies.

NUTRITION STUDIES OF CHILDREN

Although children's diets have improved over the years with the spread of the knowledge of nutrition and improved economic conditions, we are a long way from reaching the goal of providing a good diet for every child. The most common inadequacies occur in the calcium, the vitamin A and the ascorbic acid intake as compared with the desirable amounts recommended by the National Research Council.

Influence of Age. In a report on a series of studies[9] it has been shown that children of elementary school age in general have better diets than teen-agers. The younger children drink more milk and eat more servings of citrus fruit, green and yellow vegetables, meat, fish, fowl and eggs. Data are drawn from studies in Chicago, Tennessee, New York and Maryland. Even in Alaska, children under 10 were shown to have relatively better food habits than older children. Some of this is shown in the top section of the chart on page 195.

Studies on Vitamin C Intake. That even elementary school children may

[9] Nutrition Committee News, July, 1952, Bureau of Human Nutrition and Home Economics, N.P.S., U.S.D.A., Washington 25.

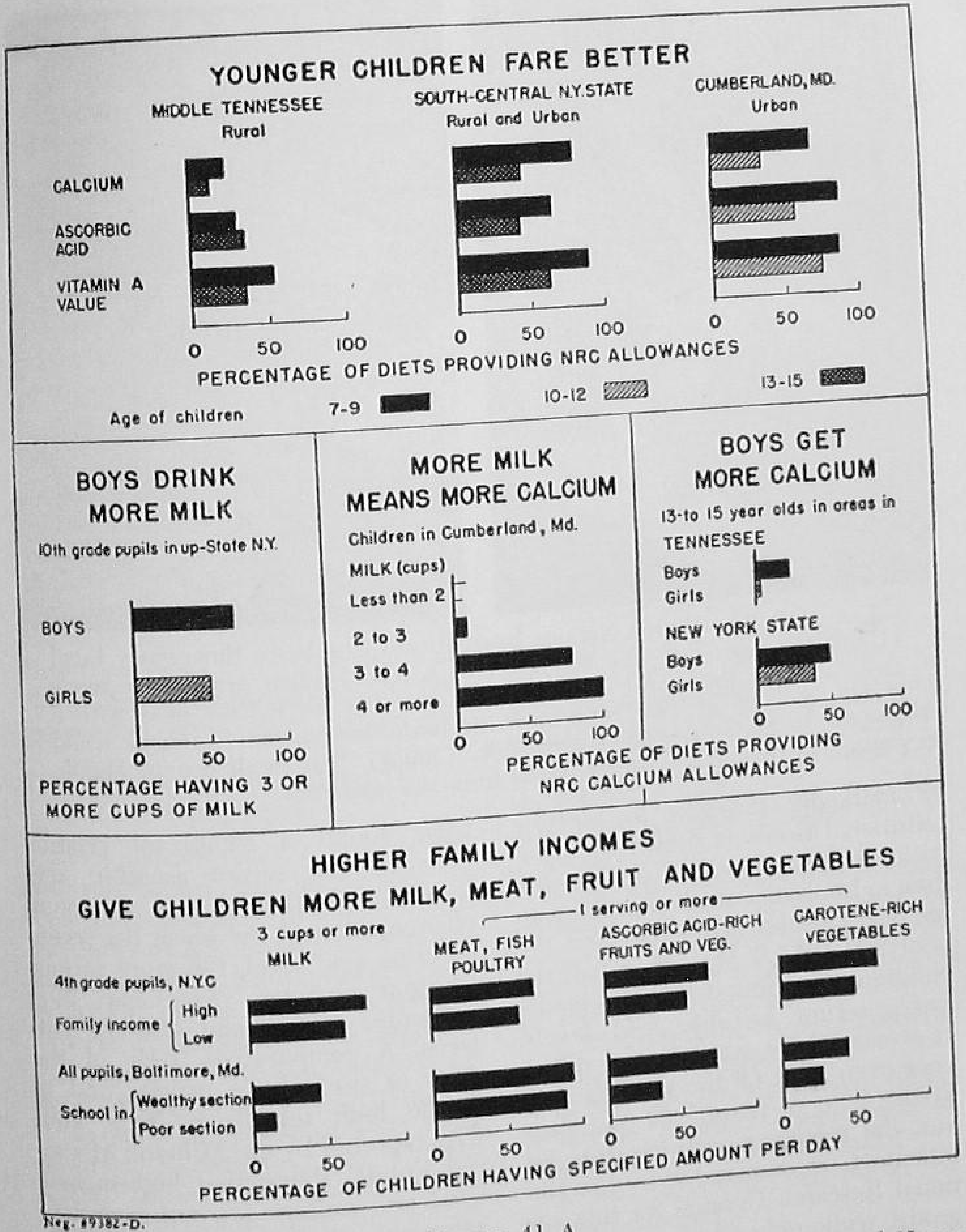
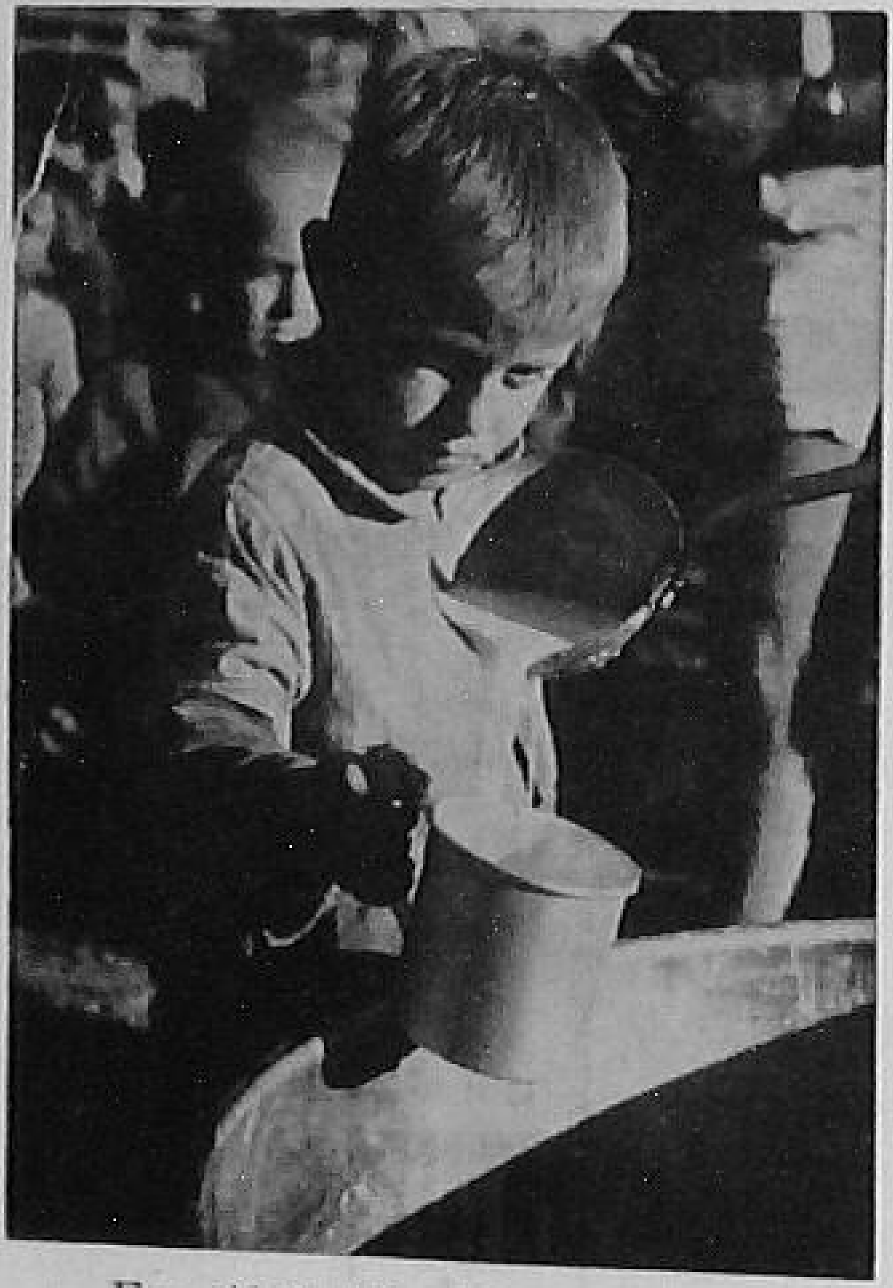


FIGURE 41 A

(Nutrition Committee News, July, 1952, Bureau of Human Nutrition and Home Economics, N.P.S., U.S.D.A., Washington 25, D.C.)



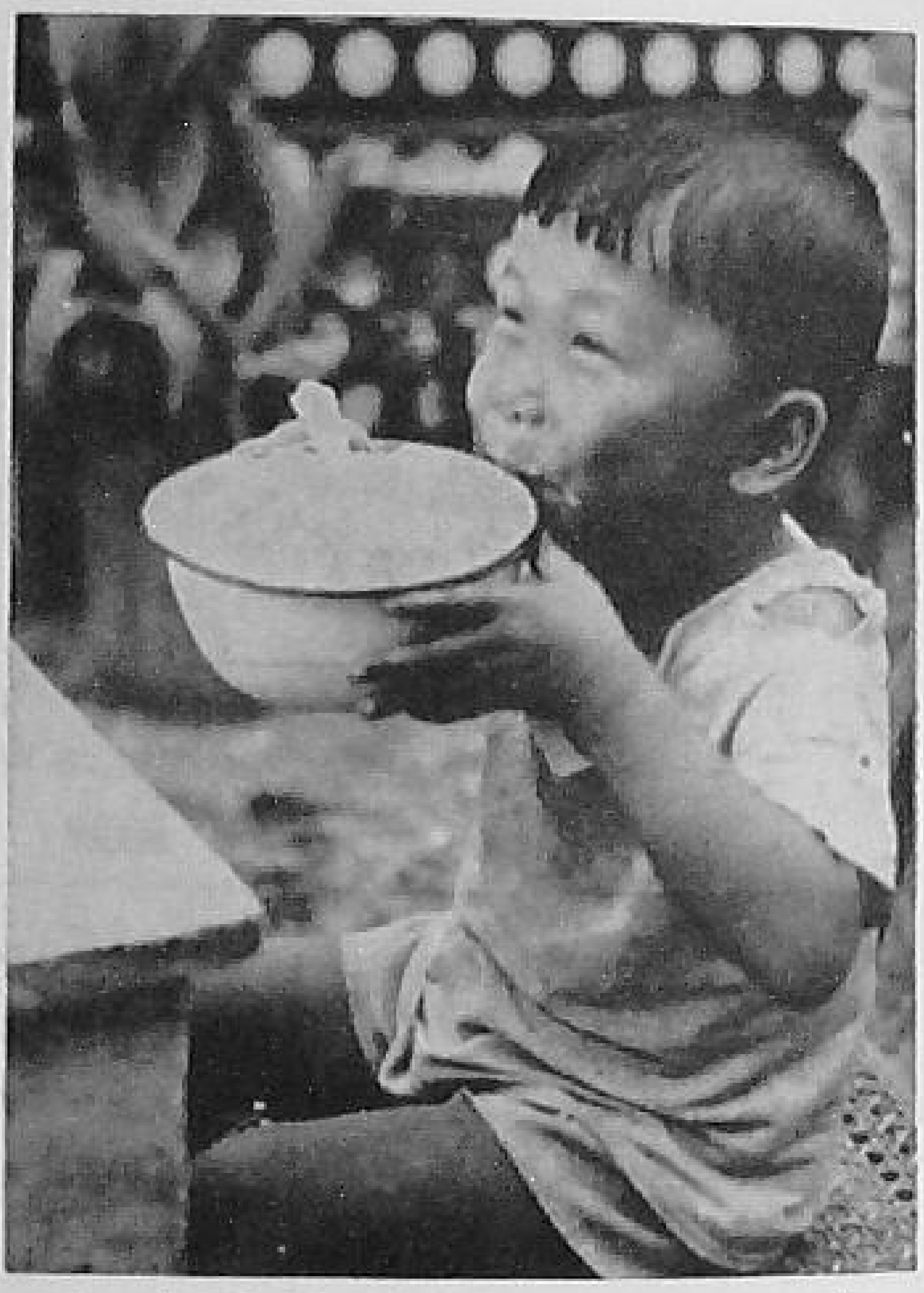


FIG. 41 B. The United Nations International Children's Emergency Fund (UNICEF) carries on the beginning of a school lunch program in many areas all over the world. Each country matches UNICEF's food with a contribution of its own. (*Left*) With tense anticipation a Greek child watches as his cup is filled with milk. (*Right*) This small boy in Manila relishes his lunch—a porridge made from rice and milk.

be markedly deficient in meeting nutritional needs is shown by a nutrition survey of more than 500 children in Louisiana, studied in the winter of 1950 and in the fall and the winter of 1951.[10] More than half the children were found to have inadequate serum ascorbic acid levels. However, there was an age difference even here. Of the younger children (7 to 9 years), 61 per cent met the minimum requirements for vitamin C recommended by the National Research Council for this age group, while only 44 per cent of the 10-to-12-year age group met the recommended minimum. The authors found a significant relation between the serum ascorbic acid levels and the degree of gum changes; that is, the lower the serum ascorbic acid level, the more serious the gum changes. (See Chap. 20.)

Income Levels and Culture Patterns. A comparative study of the diets of students in private and in public high schools in New York City reported by the Milbank Memorial Fund[11] shows that high-income level and culture are not complete assurances that food intake will be adequate in every respect. The average intake of the private-school pupils generally exceeded recom-

[10] Dallyn, M. H., and Moschette, D. S.: J. Am. Dietet. A. 28:718, 1952.

[11] Wiehl, D. G., and K. Berry: Milbank Mem. Fund Quart. 23:353, 1945.

mended allowances of the nutrients, protein, iron, calcium, vitamin A and ascorbic acid which were included in the study. Both boys and girls, however, fell below the recommended level of calcium per kilogram, and the girls were short in iron per kilogram. The public-school pupils generally had a lower average of these nutrients, and the total intake was seldom more than equal to recommended standards and sometimes fell below them. Certain national differences were noted. In the Jewish group, the diets contained larger amounts of calcium and vitamin C than did those of the group of Italian parentage, while the latter group was higher in vitamin A.

That, in general, children of families with higher incomes have better diets than those of low-income families is shown graphically on the bottom section of the chart on page 195.

THE SCHOOL LUNCH PROGRAM

Both parents and teachers long ago recognized the importance of some provision for the school lunch, and in many communities there was some concerted effort toward providing for this in individual schools. Federal assistance became available first in 1933. This was followed by distribution through the Department of Agriculture of surplus farm commodities. Eventually, the National School Lunch Act, which became effective in 1946, put the school lunch program on a permanent basis. The Act is administered by the Department of Agriculture with the co-operation of the State Departments of Education.

Organization. The operation of the school lunch plan is in the hands of a local sponsoring agency which generally consists of school officials. Applications for aid may be made by both public and private nonprofit schools. The Federal funds are used to reimburse the schools for a percentage of the cost of the food purchased. These funds must be matched in amount with funds from state sources. In addition, from time to time, the U. S. Department of Agriculture offers the schools supplies of foods, both from its own surplus-removal purchases and from special purchases for the school program.

Type Lunches. Reimbursement to the schools is made according to the type of lunch provided. When there are facilities for the preparation and the serving of a plate meal high in nutritious foods, reimbursement up to a maximum of 9 cents per meal may be allowed. This is known as the Type A lunch, and it consists of the following foods:

1. One-half pint of whole milk as a beverage.
2. At least two ounces of a high-protein food, such as dry beans or peas (½ cup, cooked), cheese, egg (1), fish, lean meat, peanut butter (4 tablespoons), or poultry.
3. Three-fourths cup of vegetables or fruit or both.
4. One or more portions of bread or muffins or other bread made of whole-grain or enriched flour.
5. Two teaspoons of butter or fortified margarine.

The Type B lunch, used by schools with limited facilities, furnishes only two-thirds as much food, and it should be supplemented by food brought from home. Maximum

reimbursement for this type is 6 cents. Where lunchroom facilities are entirely lacking, one-half pint of whole milk (known as Type C lunch) may be furnished with a maximum reimbursement of 2 cents.

For the fiscal year which ended in June, 1952, $85,000,000 was allocated under the National School Lunch Program for distribution among all the states and territories. It is estimated that 9,500,000 or 30 per cent of our school children received some benefit from this appropriation, which was matched by the states and the territories.

The benefits of the school lunch program are both direct and indirect. School children receive food which improves their nutritive health. At the same time, they form better eating habits which may carry on to later life. This is economically important in two respects: a better diet improves health and efficiency. At the same time, an ever-increasing demand for milk and other farm products helps ensure the stability of American farms and provides wider markets for American farmers.

NUTRITION EDUCATION

As has been suggested in earlier parts of this chapter, many factors influence the food intake and the nutritional status of growing children. So far we have said little of the effect of a good community program in ensuring better dietary habits than now exist in large sections of our country. The nurse, either as homemaker or as a worker in public health, may well find herself called upon to contribute to such a program.

What can be accomplished in improving the food intakes in children is shown in a recently published report of a program of nutrition education in Ascension Parish, La., carried out from 1944-48 and re-evaluated in 1950-51.[12] The project included participation by schoolteachers, school lunchroom managers and parents, and was carried on by them after the original investigator left. Nutrition was made part of the school curriculum and centered upon the needs, the interests and the age levels of the children. It became the core of a school program which was based on community needs, having as its theme "The Improvement of Living Through Community Education." As can be seen by the chart on page 199, marked improvements in food intakes occurred during this program. That these have been maintained by and large is shown by the 1950-51 evaluation.

EVALUATION OF GROWTH AND NUTRITIONAL STATUS

It has been the custom for many years to evaluate a child's progress by comparison with others of his age group. Height and weight tables often have served as the only criteria by which growth has been measured. This, however, tells us nothing of the child's growth in relation to his hereditary background, nor of environmental factors which affect his rate of growth and development. Height and weight tables for children will be found in Part Four, but it must be remembered that they tell only part of the story. Moreover, a child's growth is better evaluated in terms of his own previous performance.

[12] Whitehead, F. E.: J. Am. Dietet. A. 28:622, 1952.

STUDY IN NUTRITION EDUCATION IN ASCENSION PARISH, LA.[13]

INTAKES OF FOOD GROUPS—GRADES 2 TO 11—COMPARED WITH STANDARDS BASED ON THE RECOMMENDED ALLOWANCES OF THE NATIONAL RESEARCH COUNCIL

Food Group	*Percentage of Standard*		
	1944–5	1947–8	1950–51
Milk	46	57	60
Eggs	50	76	90
Fruit:			
Non-citrus	56	76	78
Citrus	35	60	69
Meat, lean only	109	124	89
Whole grains	29	84	54
Butter, fortified margarine	23	40	58
Potatoes, Irish, sweet	57	91	98
Vegetables:			
Green leafy	18	47	45
Other	110	123	126

[13] Whitehead, F. E.: *Ibid.*

In judging the total nutritional status of a child we look for many factors. Good bone and tooth development, good posture, shining hair, good muscle turgor, clear skin and eyes, plus alertness and curiosity, are all indications of good health and reflect the effect of proper nutrition.

Long-term studies now are in progress in such research centers as The Child Research Center in Denver, Colorado, the Fels Research Institute for the Study of Human Development at Yellow Springs, Ohio, in the Department of Maternal and Child Health at the Harvard School of Public Health in Boston, Massachusetts, and in many others, to observe the child's growth and development in relation to his own pattern and to study the interrelationships of all the environmental factors, social, economic, nutritional, psychological, as well as the hereditary factors, on this pattern and rate. In this way the investigators hope to obtain a broader viewpoint from which to evaluate a child's progress into maturity.[14]

STUDY QUESTIONS

1. In what ways does environment affect the nutrition of a child?
2. Make out a menu for a day for a rapidly growing 2-year-old child. How much milk should be included? In what manner may this age child prefer to eat some of his food? Should this be permitted? Why?
3. It is important to establish good food habits in the early years of childhood. Outline factors other than the supplying of adequate food that are important. Criticize methods which are sometimes used to entice a child to eat.
4. At what age do caloric intake differences begin to appear between boys and girls? Compare their average caloric intake at 10 years of age

[14] Symposium, The Child, Vol. 16, No. 4, December, 1951.

age with your own. Is there much difference? Why is this?

5. What foods in what quantities should appear daily in the diet of the school child?

6. Make out a menu for 5 box lunches a child can carry to school, each of which will meet approximately a third of his daily requirement.

7. New feeding problems may occur after a child enters elementary school. What are these, and how may they be met?

8. What are the food needs during the rapid growing period in adolescence? Do girls have additional nutritional needs compared with boys? What are these and why do they occur? What foods should be included daily in the diet of both boys and girls at this age?

9. What evidences have we of malnutrition among school children? What are some of the causes of such malnutrition? What is being done about them?

10. How can the school nurse make an effective contribution toward the development of a good school lunch program?

11. What do we mean by growth? What is meant by development? Why are height, age and weight tables only one indication of growth and development? What studies are being done now to give us better methods of evaluation?

12. List the indications of good nutritional status.

CHAPTER FIFTEEN

Nutrition for Adults, Young and Old

THE PROBLEM OF ADULT NUTRITION
OUR AGING POPULATION
PROLONGING ACTIVE MIDDLE YEARS
FOOD HABITS AND REQUIREMENTS OF OLDER PEOPLE
FOOD FOR OLDER PEOPLE
THE USE OF VITAMIN CONCENTRATES
FOOD FADS AND FALLACIES

THE PROBLEM OF ADULT NUTRITION

The science of nutrition gives major consideration to the food requirements for growth, and with good reason. It is during this period that nutritional deficiencies are most likely to show. On the other hand, it is also true that this is the time when results of good nutrition are the most striking. But the time has come for more consideration of adults, both young and old. Webster defines an adult as "a person . . . who has reached maturity or attained full size and strength." It is apparent from numerous studies that many adults never did attain their potential "full size," nor are they able to maintain "full strength" if they ever attain it. Good nutrition is only one of the health practices which help in maintaining strength and vigor, but it is one which can be practiced more often and is abused more frequently than any other.

Occasionally, people with exceptional heredity may be able to maintain vigorous health throughout life without apparent effort or precautionary measures; but certainly the surest foundation for a long period of usefulness and activity is that laid in childhood and preserved through youth and adult life. The relative values of scientific health engineering and heredity are already beginning to show up in the physical and mental development of the present generation. It is a statistical fact that boys and girls who entered college during the decade ending in 1943 were taller, though younger, than their predecessors of a generation earlier. This trend in our young people is undoubtedly due to better health practices while they were children. The same factors are also contributing to better health and strength in our adult population, but there is still room for improvement.

Sherman is a strong advocate of "the nutritional improvement of

life" and has ably expressed his ideas on the subject in a series of articles[1] under the title of "Nutrition Engineering." His introductory paragraph is as follows:

"Every time a farmer grows a really good plant or animal, he is demonstrating a fact and principle that people have been slow in applying to themselves. This is the fact that full health is more than merely freedom from disease; rather, it is a positive quality of life that can be built to higher levels. To generalize this fact, and give it a formal scientific aspect, we may call it the principle of the improvability of the norm."

It has been recognized for centuries that signs of senility might be deferred, but few people were concerned until it was too late. Roger Bacon, the scientific monk of the thirteenth century, claimed that the three causes of old age were infection, negligence and ignorance. With regard to aging, Bacon said:

> No one wishes to take thought in regard to methods of prevention, not even physicians, since we see that scarcely one physician in a thousand will give this matter even slight attention. Very rarely does it happen that one pays sufficient heed to the rules of health. No one does so in his youth, but sometimes one in three thousand thinks of these matters when he is old and approaching death, for at that time he fears for himself and thinks of his health. But he cannot then apply a remedy because of his weakened power and senses and his lack of experience.

As a method of attack on the problem Bacon suggested "that the wonderful and ineffable utility and splendor of experimental science may appear and the pathway may be opened to the greatest secret of secrets." Experimental science is pointing the way, as Bacon predicted, but human nature has not changed greatly since his time.

It is not surprising that this complex human machine of ours gets out of order occasionally; the wonder is that it does not do so more often when it is given so little intelligent care. The delicate organs and tissues of the body continue to do their respective jobs for many decades if given half a chance. No one expects a man-made machine to last as long as that without special care and renewal of parts. Nature has a remarkable ability to repair or compensate for worn-out or injured parts if given the opportunity and the right materials. As Sherman has put it:

> It is becoming increasingly clear that, however important the inherited constitution, there is yet a great opportunity open to each of us to provide for such a favorable internal environment as shall permit each person's native endowments to develop and function most effectively, so that the individual finds fullest satisfaction in life and at the same time renders service of the greatest social value.

None of us is too young to begin thinking about improving the health of later years. People buy annuities and life insurance for the future; why not consider other steps which may give even greater security and comfort?

OUR AGING POPULATION

The aged and the aging should be clearly distinguished: the aged

[1] Sherman, H. C.: Nutrition Engineering, J. Franklin Inst., July, Aug., Oct., Nov., 1944.

are people, aging is a process. According to Stieglitz:[2] "Aging is continuous. It begins with the onset of life at conception; it can be terminated only by death. Aging may be defined, perhaps, as those changes which are introduced by the factor of time in living." Thus birth, growth, maturation and senescence are all part of the normal aging process. Aging proceeds more rapidly during the growing years because change is more rapid at that time. In the adult the aging process slows down and the rate of this change may be further retarded and the active period of life may be extended by good health practices.

Adult nutrition problems deserve and demand consideration even more as our adult population increases. Less than half the population was over 20 years of age in 1850, 59 per cent were over 20 in 1920 and about 69 per cent were over 20 in 1950. The nutrition of this 69 per cent of the population is the subject of this chapter, "Adults, Young and Old."

The life expectancy has increased at an unprecedented rate in the last century. Modern sciences have made it possible for more babies to live to grow up and for more people to live to grow older. From the accompanying graph it may be seen that it was slow progress from the period of the Roman Empire, when the life expectancy was 23 years, to 1850 in New England, when it was 40 years. The next 50 years up to 1900 showed an increase of 7 years in life expectancy. During the first half of the twentieth century the life expectancy in the United States has increased approximately 20 years, making the present figure close to 67 years.

The fact remains that the present rate of increase in the number of people over 65 years of age is almost five times that of the increase in the whole population. There were approximately 11½ million people over 65 in 1949, a million more women than men. The progress in health sciences, which is primarily responsible for this increase, is the control of infections and communicable diseases. Medical science knows less about degenerative and chronic diseases of middle and old age, but progress has been made in recent years in the study and the practice of geriatrics, and nutrition is an important phase of prevention and treatment.

PROLONGING ACTIVE MIDDLE YEARS

Food can exert a profound influence upon vitality and longevity, but it is the former which will be dealt with in these paragraphs. As Sherman has expressed it:

> A striking aspect of the nutritional improvement of life is that, with food habits guided by present-day knowledge, full adult capacity and efficiency can be reached at an earlier and held till a later age in the same individual. This means both higher attainment and the holding of one's highest capacity for service and for enjoyment of life over a longer time.

Because it had been regarded as established that "longevity depends on heredity," even scientifically trained people have been (perhaps still are) a little slow to assimilate the now fully

[2] Stieglitz, E. J.: Geriatric Medicine, Philadelphia, Saunders, 1943.

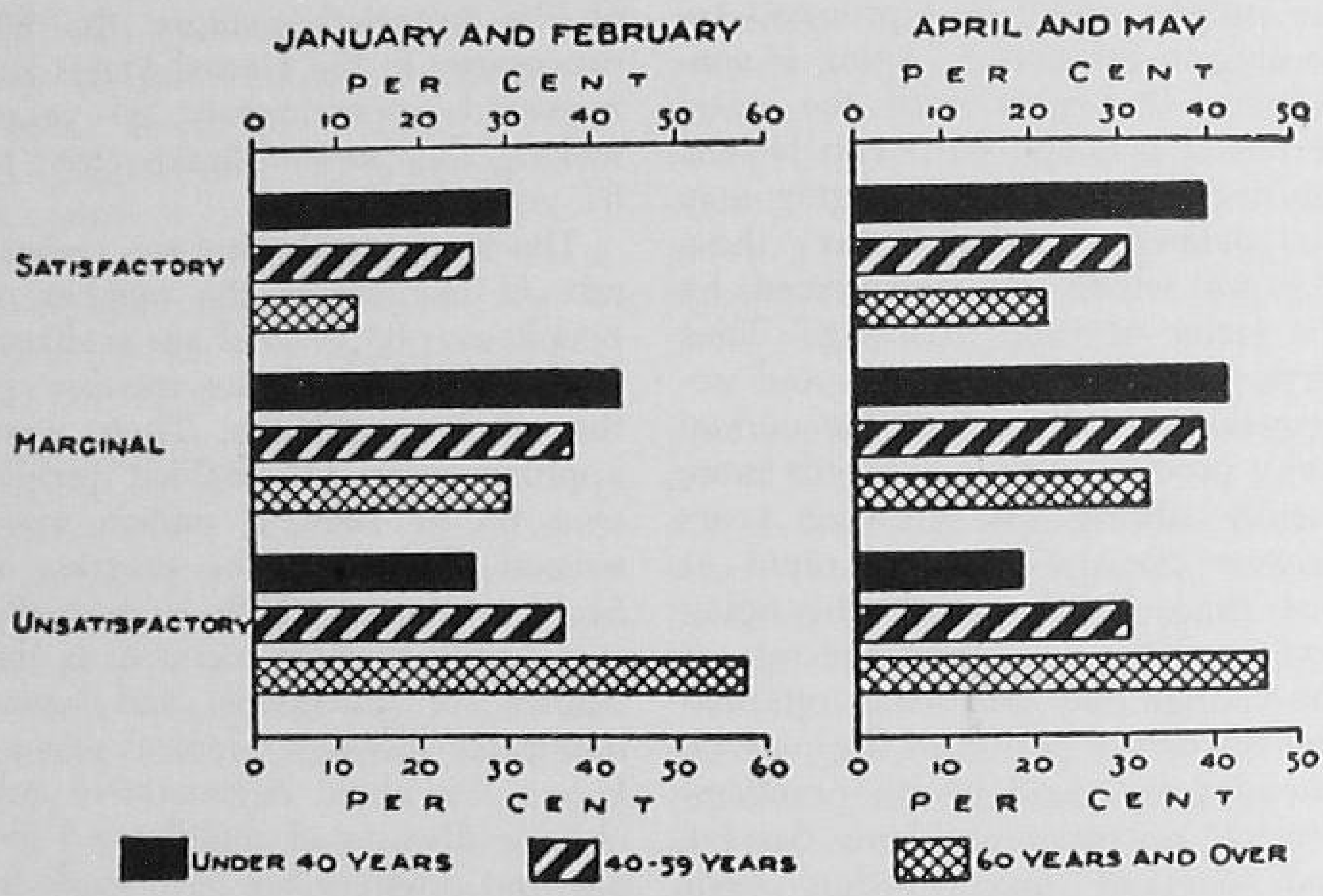


FIG. 42. Food habits in relation to age of homemaker. (Percentage distribution of composite ratings.) (Downes, J., and Baranovsky, A.: Milbank Mem. Fund Quart. 23:161, 1944)

demonstrated fact that both heredity and nutrition are major factors in determining the length of normal lives.

The extra years which the science of nutrition offers, whether these be estimated at seven or ten, more or less, are not to be thought of as added to age. Rather, they are inserted at the prime (in any life that was not begun too soon to get the full benefit of the newer knowledge). In social-economic terms this means a continuation of the current increase in adult expectation, and with a smaller percentage of years of dependency.

Thus, as each of us decides his food habits, he practices (whether consciously or not) his individual sort of nutritional engineering of his own life processes, and thus of his career.

Nutritional indiscretions among adults are not confined to any particular class, although the problems among low-income groups are apt to be greater. Too much, too little or the wrong kind of food—each is a problem for special consideration. Famine conditions in certain countries of Europe where scientific observations have been reported throw light on the effect of the quantity of food and the incidence of certain diseases. Stare[3] found that in northern Holland throughout the winter of 1944-45 the average caloric intake for adults was estimated at from 1,200 to 1,400 and in March and in April, 1945, at from 800 to 1,000 calories. Clinical evidence of real starvation was abundant in all urban areas, the most common symptoms being loss

[3] Stare, F. J.: Nutrition Rev. 3:225, 1945.

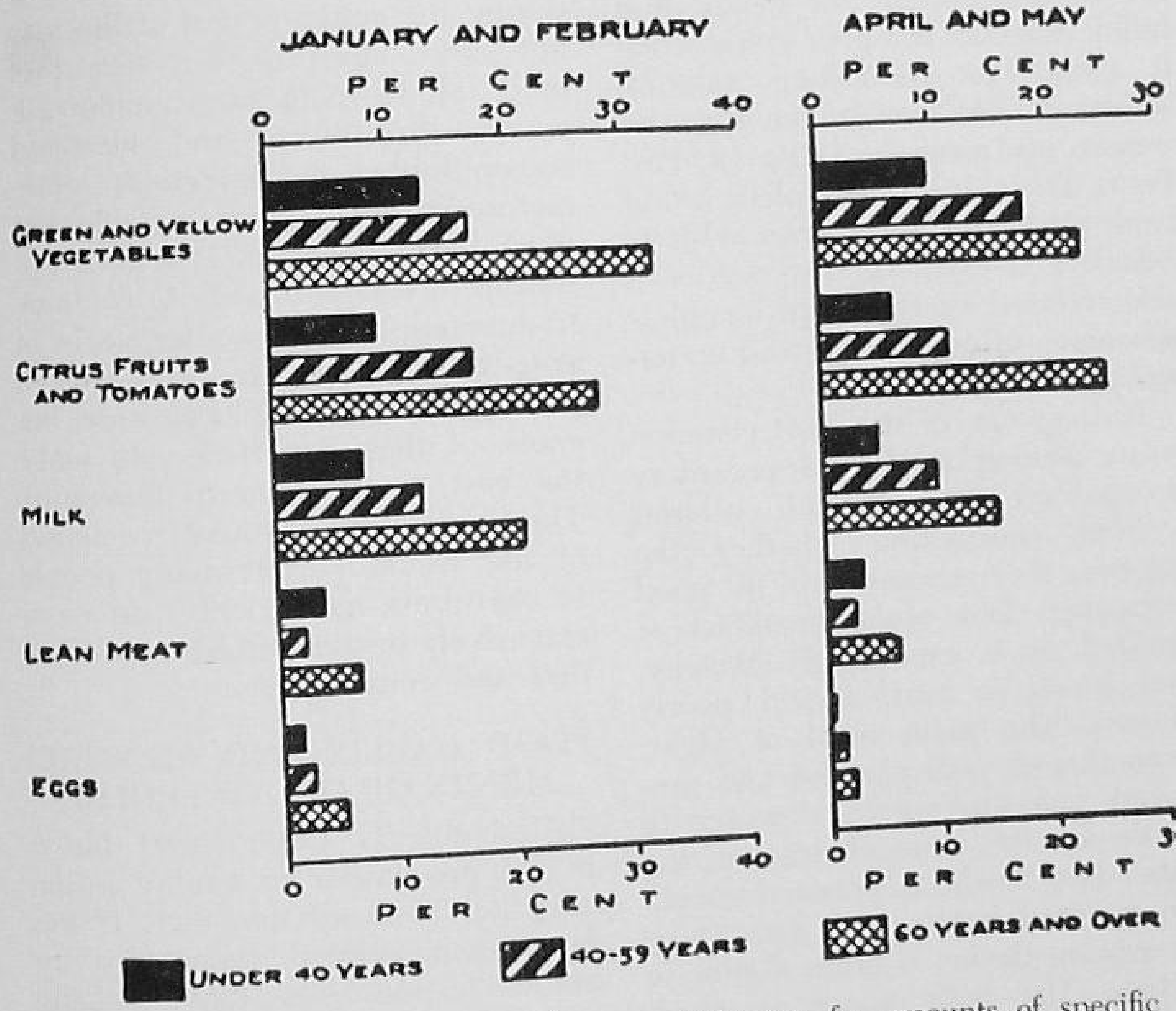


FIG. 43. Food habits classified as unsatisfactory for amounts of specific food groups according to age of homemaker. (Percentage distribution.) (Downes, J., and Baranovsky, A.: Milbank Mem. Fund Quart. 23:161, 1944)

of weight, edema, with weakness, fatigue, diarrhea and muscle pains. Tuberculosis increased from 4 to 5 times, and intestinal diseases, ulcer and hernia had increased. "Interestingly enough, heart disease, hypertension and obesity had greatly diminished," says Stare. Vital statistics in this country show heart diseases, hypertension and other chronic diseases associated with obesity at the top of the list of causes of death or of chronic disability in middle-aged people. On the other hand, tuberculosis, ulcer and diseases associated with emaciation are well toward the bottom of the list as causes of death. Insurance companies have also long been warning more against overeating than undereating among adults in the United States.

Weight control is one of the first things to watch. Undereating and overeating both constitute problems, but the latter is more common and more serious from the standpoint of healthful longevity. To be really fit, body weight should be not more than 10 to 15 per cent above or below

the desired weight for height and build. Appetite is a poor guide when it comes to controlling calories. Tables of ideal weight for men and women are given in Table 12, Part Four. Table 1 is a complete list of food values for those who wish to calculate their diets. The reader is also referred to the more complete discussion of overweight and underweight (Chap. 18).

Perhaps one of the most common errors among adults in sedentary occupations is to watch calories without considering whether the calories they choose are in good company. Too often breakfast is omitted or is exceedingly sketchy, and lunch is hurried and poorly chosen. The main meal at night, even though well planned and prepared, can scarcely be expected to make up for poor choices at the other two meals. A personal check-up on food habits with some type of scoring device is often a spur to action. The body needs as much good protein, minerals and vitamins when losing weight as when it is normal. It is more difficult to get enough protective factors when eating a lower total quantity of food; therefore, the choice has to be watched more carefully.

The nervous strain under which business executives and professional people frequently work can be tolerated only by a body in prime physical condition. Men and women in our factories today are protected from industrial hazards, but only recently has the provision of the right food for physical stamina had recognition as an important phase of industrial-health work. The nutritional indiscretions and deficiencies during the active period of life may not strike abruptly, but they take their toll in inefficiency, minor ailments, discomforts and increased susceptibility to infections. Premature senility is not inevitable, but it is all too frequent. It is false optimism to expect a body to continue to function normally after years of poor food habits. Men and women past middle life should be able, because of their experience, to make the best contribution to humanity. The lengthening of the active period of life would permit many people to contribute more richly and more extensively to the well-being of families and communities.

FOOD HABITS AND REQUIREMENTS OF OLDER PEOPLE

Undoubtedly the greatest factor in the prevention of senility is the adoption of a suitable diet. It has been demonstrated repeatedly by animal experiments that the life span of animals may be increased by raising the amounts of protective foods beyond those considered essential for normal growth and maintenance. The period of vigorous activity and health is extended well into what would be considered old age for that species.

One of the marked changes in old age is decreased metabolism—a lowering of the body fires. Metabolism is reduced from 10 to 50 per cent as age advances. At the same time bodily activity is decreased, so that the caloric need is also reduced. A total intake of 1,200 to 2,100 calories per day may be sufficient. The food which supplies this must be chosen carefully and must include essential factors. It is now believed

that many afflictions of old age are caused by malnutrition. The limited amount of food usually eaten frequently results in protein, vitamin and mineral deficiencies. The habitual food pattern of many years is also significant.

The food habits of older people do not always fall in line with their food needs. Many of them develop a craving for sweets and seldom make the necessary compensation in the choice of other foods to provide the essential amount of B complex vitamins to take care of the extra carbohydrate. Sometimes the difficulties of marketing and food preparation prompt a simplification of meals with the omission of fresh fruits and vegetables. This tendency was disclosed by a survey made of the food habits of families in Baltimore.[4] Records were kept of the amount and the frequency of use of certain foods during one week. The 943 families in the survey were divided according to the age of the homemaker. The ratings of the food habits shown in Figure 42 indicate that by far the largest number of unsatisfactory diets were found in the homes where the homemaker was over 60 years of age. When the types of foods omitted were studied, it proved to be the green and the yellow vegetables, fruits and milk that were most often inadequate (Fig. 43).

FOOD FOR OLDER PEOPLE

Emphasis on an adequate diet for older people seems to be more than justified in view of our present knowledge of nutrition and its relation to some of the degenerative changes of advancing years. Yet many older people have poor food habits, as has been noted. Bulletins and pamphlets published by national and state agencies and by insurance companies give simple information about food for older people. Among these, attention is called to those published by the Bureau of Human Nutrition and Home Economics[5] and by the Community Service Society of New York,[6] which are suitable for the layman, and one by the American Dietetic Association,[7] which is suitable for managers of small homes for the aged, in helping to plan and serve meals which are attractive, satisfying and beneficial.

The planning of food to meet the needs of the older age group presents many problems, which are as varied as the circumstances under which such people are living. They may be living alone or with one or two other older people and marketing and preparing meals for themselves; they may be the older member in a younger family; they may be cared for by a practical nurse or a housekeeper. Whoever is responsible for planning and preparing food should be aware of likes and dislikes, special needs and limitations. There are numerous factors which should be considered, such as ignorance of nutritional facts, food prejudices, fear of new foods, lack of money,

[4] Downes, J., and Baranovsky, A.: Milbank Mem. Fund Quart. 23:161, 1944.

[5] Food Guide for Older Folks, Home and Garden Bull. No. 17, U.S.D.A.

[6] Food for Health as We Grow Older, Community Service Soc., New York City.

[7] Eating is fun for older people too, Am. Dietet. A., 1952.

limited cooking facilities and poor appetite. The public health nurse may be able to advise or help with the planning where such problems seem to interfere with obtaining adequate food.

The caloric needs of older people are lower than when they were younger because the rate of metabolism and activity diminish with age. The appetite does not always change correspondingly. Sometimes the appetite fails to tempt people to eat enough food or perhaps circumstances have prevented them from getting sufficient food. The malnutrition which may occur in older people can be remedied by attention to foods with low bulk and high calories prepared in a way which the person enjoys.

More often the appetite prompts older people to eat more food than they need, and the result is a tendency to gain weight. Since these people need fewer calories, there is an obvious need for foods which carry a full quota of proteins, minerals and vitamins. The day is past when a reduction in the amount of all foods is a satisfactory solution. It is essential to reduce consumption of empty calories, rich desserts, cakes, candies, fats and alcohol. Not only from human experience but from studies with small laboratory animals is it shown that a thin body during adult life extends the life span and helps avoid some of the common diseases of later life.

Reduction in total calories involves the most difficult task of alteration of food habits. Habits of eating play a significant role in nutritional problems. Habit is perhaps one of the greatest obstacles in the path of an optimal diet by the majority of persons. The longer the habits have been indulged in, the more fixed they become. The food habits of older people are apt to be so fixed that it's difficult to change them unless the way is made easy and temptation to eat the wrong foods is avoided. The elderly person may lose his appetite for rich foods, but for those in late middle life the food habits of more active years persist after activity has decreased.

On the other hand, protein needs are not reduced appreciably with age, and yet many older people eat less protein than when they were younger. The elderly are more prone to suffer from protein starvation than from any other form of deficiency. Mild deficiencies may be manifested by a sense of habitual fatigue. Thus, some good quality protein at each meal is essential for health. This can be accomplished by the use of milk, eggs and cheese, as well as meat, fish or poultry, supplementing the protein from plant sources. Some older people dislike or resent the advice to drink milk, and yet milk is not only a good source of protein but a major source of calcium as well.

The calcium needs of older people seem to be appreciably greater than those of younger adults. Studies made at Michigan State College by Roberts *et al.*[8] show that the calcium requirements of their group of older women were higher than figures obtained previously on younger women. Loss of calcium from the bone leads to osteoporosis and serious fragility so frequently respon-

[8] Roberts, P. H., *et al.*: J. Am. Dietet. A. **24**:292, 1948.

sible for fractures. Lowered gastric acidity and hepatic and pancreatic insufficiency may contribute by impairing calcium absorption. Thus, the diet should provide liberal amounts of milk and milk products. These may be used in cooking, cream soups, milk desserts, etc. The use of nonfat dry milk is to be encouraged in cooking as an inexpensive source of good protein and calcium.

Unfortunately, little is known regarding the vitamin requirements of older people and whether there is a change with age or associated with chronic disease. There is no evidence, however, that vitamin requirements are reduced with advancing years, and it is safe to assume that older people need all the vitamins that they did in earlier years. Tuohy[9] presents evidence that thiamine has a specific action in restoring muscular activity of the gastro-intestinal tract through its function in connection with carbohydrate metabolism. This is in line with Whitney's[10] observation of the beneficial effects of thiamine in chronic constipation. There is evidence that other fractions of the B complex may function also in maintaining normal muscle tone in the intestinal tract. The place of vitamin concentrates in the regimen of older people is discussed in the following section.

THE USE OF VITAMIN CONCENTRATES

The evidence from experiments on active men would indicate that when the diet is adequate in all known nutrients, the addition of concentrates does not show beneficial effects. With sedentary people and older people who are not eating as much food as those who are active it is often more difficult to provide the requisite amounts of protective factors without resorting to supplementation with concentrates. This should be done, however, upon the advice of a physician or dietitian and after calculation of what the usual diet provides and what specific needs are indicated. The addition of the vitamin B complex in concentrated form, for instance, may correct certain digestive disorders and relieve other ill-defined aches and pains—in fact, retard some of the signs of senility.

When people buy and take all types of vitamin concentrates without scientific advice and regardless either of what ails them or of the natural vitamins present in their daily diets, it takes on the earmarks of a fad. Vitamins from the grocer are usually cheaper than from the druggist, and they come in Nature's packages done up with other valuable food constituents instead of alone and labeled in units. But when dietary restrictions, common indeed among adults, make it difficult or impossible to obtain enough of certain vitamins in natural foods, vitamin concentrates have a rightful place. One may have confidence in the integrity of concentrates put up by several reputable pharmaceutic houses. They are labeled according to the amount of each vitamin present in milligrams, micrograms or International Units per tablet, capsule or measure. The law

[9] Tuohy, E. L.: J.A.M.A. 114:223, 1940.

[10] Whitney, E. T.: Bull. New England M. Center 6:170, 1944.

is strict in holding the manufacturer to these figures on the label.

FOOD FADS AND FALLACIES

The futile efforts that are often made by those suffering from chronic ailments to improve the state of affairs by pseudoscientific devices reflect an interest and a striving for something better in terms of health. The human psychology that afforded a profitable outlet for the patent-medicine quack generations ago has offered an equally profitable one for the food faddist in more recent years. Yet such a nutrition-conscious public is as fertile a field for constructive scientific education. It is easy to listen to misleading radio advertising, to read unreliable health literature, to follow suggestions of neighbors or friends and to be misguided by ideas with a plausible sound. Why not ask advice of medical and nutrition authorities? Some food fads in themselves may be relatively harmless but when they lead to delay in seeking necessary medical advice they can be dangerous indeed. In any event, food fads may increase food costs unduly and result in the omission of foods really needed.

Professional people in general have been prone to condemn this interest in dietary and food fads without qualification. Perhaps this interest should be diverted into profitable and beneficial channels rather than stifled. Suitable literature in doctors' offices and in public libraries and popular nutrition classes and lectures given by qualified physicians and nutritionists may help to guide this interest. Perhaps the professional groups have not given the layman what he wants and so he turns to quack health lectures and literature in an effort to "do something about his health."

The commercial advertising of food products seems to be somewhat less objectionable now than it was a decade ago. Perhaps some of the adverse publicity and complaints have had an effect. There are still some candies and other sweets that expound the idea of "health and vitality" through "cheap, quick energy." Obviously, such statements are misleading and tend to exaggerate the nutritive value of candy. These advertisements are frequently addressed to young people who have only a few nickels to spend for their lunch and desire the most for their money.

There are many dietary fads which may be harmless but senseless. Too often they detract from the pleasure of eating, an important element in good nutrition. Variety is in itself a safeguard, and, when variety is severely limited, as it is by some fads and self-imposed restrictions, certain nutritive factors are apt to be low or absent. Nor is there magic in any specific food item. It makes little difference whether one obtains his nutritients from fluid milk or milk powder, from milk products such as cheese, yoghurt or ice cream, or whether he gets them from meat, fish or fowl, wheat germ, whole grains or blackstrap molasses. The essential point is to get an adequate supply of each nutrient from food which tastes good. The Mexican, the Greek and the Italian each may prefer his native

foods irrespective of nutritive value. Surprisingly enough, native dietary patterns often provide nutrients which meet recommendations just as well as the typical American patterns and far better than the fad diets consumed by some native Americans.

So-called natural foods are quite apt to be recommended along with raw foods: raw in place of refined sugar, sea salt in place of table salt, olive oil in place of other fat, lemon juice in place of vinegar. Except for price, there is no particular objection to these, but neither is there anything poisonous or harmful in the foods for which they are substituted.

Certain vegetable juices have been accredited with more virtues than they actually possess. An increased consumption of vegetables, to be sure, is advised by nutritionists, but there is no scientific foundation for such claims as: celery juice for indigestion and rheumatism, carrot juice for the complexion, parsley juice as a building tonic, garlic juice for high blood pressure, white radish and lemon juice for the gallbladder. If and when some specific curative properties are found in certain foods, medical literature will report it with supporting evidence.

Special food combinations are "prescribed" in certain systems of eating. He who dares to indulge in protein and starches or perhaps starches and acid fruits at the same meal faces dire consequences, we are told. There is no physiologic basis for the notion that the normal human digestive apparatus is not equipped to deal with these foods, whether eaten individually or together. Most natural foods are combinations, whether we will or no; even the diet faddists cannot avoid them, but they neglect to tell their patients so.

One of the authors has written several articles on food fads and fallacies and in one article[11] sounds the following caution and adds advice on how to protect ourselves:

> Earmarks of quackery and misleading propaganda should be familiar to the layman. Extravagant claims for cure or relief of various complaints are always to be doubted. Vague labeling which offers no figures or exact information to live up to is one way by which these promoters have avoided the teeth of the law. Labels are never so extravagant as detached advertisements or literature because the laws are stricter about labels.
>
> Promoters of most of the fad diet systems or health institutes have personality, poise and persuasion. They are convincing speakers with a smattering of scientific knowledge which lends an air of plausibility to their discourse. They mix the true and the false or misleading to suit their needs, to sell their products or to scare their victims into spending money for a course of lectures to cure them of imaginary ills. They use scientific words and phrases to cover false ideas. They accomplish most by personal appearances, but they also work through the mails, the radio, the newspapers, handbills and newsstand publications.
>
> Your interests are safeguarded by such agencies as the United States Food and Drug Administration, the Federal Trade Commission, the United States postal authorities, Better Business Bureaus, state and national health associations, and the American Medical Association through its Bureau of In-

11 Mitchell, H. S.: J. Am. Dietet. A. 17:67, 1941.

vestigation and Council on Foods and Nutrition. But there are ways of evading any law or regulation. There will always be quacks and promoters who want to sell something. There will always be enthusiasts who want you to try their suggestions. Your best protection, after all, is education in the simple principles of nutrition and intelligent skepticism regarding extravagant new theories. Money spent for better food—more of the protective foods—will go farther toward promoting better health for America than the same amount of money now being spent for pseudo-health and diet fads.

STUDY QUESTIONS

1. What evidence is there that the nutritional improvement of life is possible?

2. What advances in the health sciences are chiefly responsible for the rapid increase in life expectancy during the early part of this century?

3. For what age group is there still much room for improvement in regard to nutrition?

4. What nutrients are likely to be deficient in quantity when uninformed people cut calories without guidance?

5. What foods are older people likely to omit and what nutrients will be reduced as a result?

6. In what circumstances may the use of vitamin concentrates be justified?

7. What food fads have you heard discussed or seen practiced? How would you help a layman to distinguish between fact and fad or between true and false ideas about food?

CHAPTER SIXTEEN

Food Hygiene

INTRODUCTION
COMMUNICABLE DISEASES TRANSMITTED BY FOODS
OTHER ILLNESSES TRACED TO FOODS
SPOILAGE AND ITS PREVENTION
FOOD PRESERVATION METHODS
LEGISLATIVE CONTROL OF FOODS
PACKAGING AND HANDLING
SUMMARY

INTRODUCTION

The dependence of health upon the quality and the quantity of the food supply has been emphasized in the preceding pages. Each step in food production must be controlled carefully to preserve the nutrients, to prevent contamination with harmful micro-organisms and to eliminate toxic chemical residues.

Water, milk and dairy products once were our main concern with regard to disease outbreaks, but today food products other than these are responsible for the majority of food-poisoning outbreaks. In 1950, there were 15 water-borne outbreaks, 10 traced to milk and milk products and 327 to other foods. In 1951, 7 were traced to water, 12 to milk and milk products and 256 to other foods. The reasons for the difference in the outbreaks attributed to these sources are clear if we compare the management of water and milk supplies with that accorded other foods.

A safe water supply now is considered to be a community responsibility. Outbreaks due to a water supply usually affect a large number of consumers and, therefore, arouse prompt action. Most states now examine rural water supplies and roadside wells and springs. A large part of our population has treated water supplies which are rendered safe by sand filtration and subsequent chlorination.

Milk, likewise, now is considered to be a local or a state responsibility. In most states, inspection aids in eliminating the infected milk-producing animals, goats (brucellosis) and cows (tuberculosis, brucellosis). Raw milk now is pasteurized for more than 92 per cent of our population. Safe milk flows from the pasteurizer by a closed system of pipes into sterilized bottles which are capped promptly for delivery to the consumer.

For many foods, the protection given routinely to water and milk often is lacking. Foods come from a wide variety of plant and animal sources, and they are prepared in many different types of food-processing plants and in many thousands of

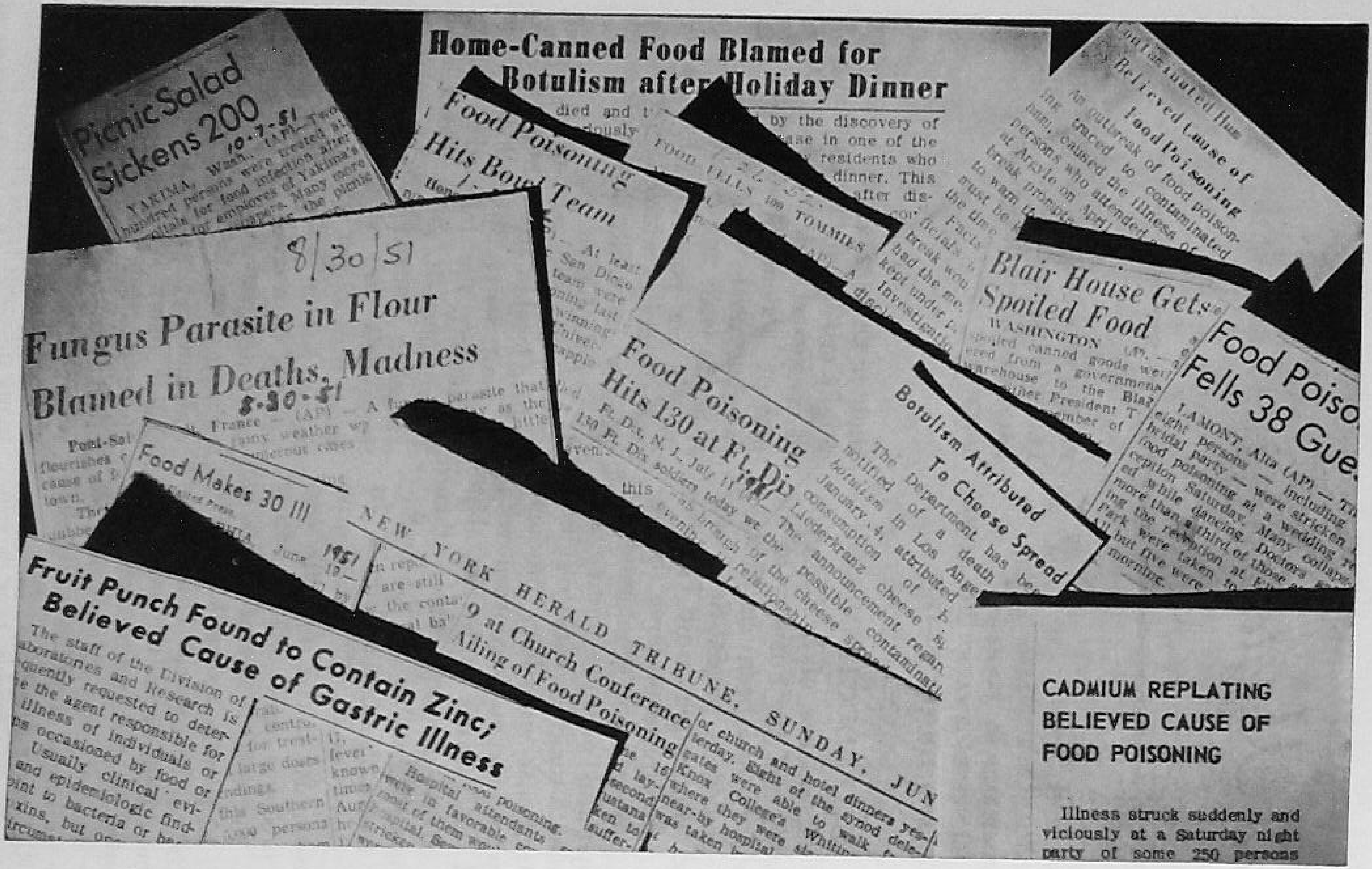


FIG. 44. Current newspaper releases and stories of some food-borne disease outbreaks. (Dr. G. W. Molyneux, *Health News*, June, 1952)

individual homes. Disease organisms from the upper respiratory area (nose and throat) and the alimentary tract may be transferred to foods by careless food handlers. Even when safety would seem to be ensured by such final stages of food preparation as baking and cooking, that safeguard may be nullified by subsequent infection in food handling.

COMMUNICABLE DISEASES TRANSMITTED BY FOODS

Diseases long associated with water (typhoid fever) or raw milk (brucellosis, tuberculosis) also may be transmitted by other foods and drinks. It is estimated that less than 15 per cent of the food-borne outbreaks, food infections and food intoxications are reported. In 1950, 30,000 illnesses were reported for three diseases related to foods—bacillary dysentery, staphylococcic food poisoning and paratyphoid fevers (salmonellosis).

Infections and infestations acquired from meat are brucellosis (by handling), tularemia, salmonellosis, botulism, trichinosis and taeniasis. Uncooked and partially cooked meats and meat products are important sources of infection. The incidence of any given disease of animal origin varies with the frequency of its existence in the related host animal, the amount of the food consumed by the general public and the processing methods used in its preparation. The inspection of meat is more important esthetically than in safeguarding health, because it is difficult to detect some diseases in animals by gross examinations. In 1952, the restrictions on Mexican cattle and meat products were removed because foot and mouth disease in cattle now is under control. Rabbit meat is considered to be a much less important transmission factor than tick bites for the 900-odd cases of tularemia in 1950. Shellfish means all fresh and frozen oysters, clams and mussels, either shucked or in the shell, and any fresh edible part of these animals. Shellfish grown in polluted and contaminated waters can transmit bacteria that cause enteric fevers. The almost complete elimination of bovine tuberculosis through animal inspection and the pasteurization of milk leaves man as the chief agent in the transmission of this disease.

OTHER ILLNESSES TRACED TO FOODS

The difficulties experienced by some individuals who are hypersensitive to specific foods, such as idiosyncrasy to cocoa, hives from strawberries, eczema from milk and diarrhea from shellfish, are discussed in the chapter on allergy.

Some foods are poisonous in themselves, such as certain mushrooms, fish and shellfish. Occasionally a metallic poison, such as arsenic from spray residues on vegetables or fruits, cadmium from metal food containers and pipes, as well as some silver polishes, may produce toxic symptoms resembling food poisoning.

Chemicals Naturally Present

Mushroom poisoning is the most familiar example of illness due to poisons occurring naturally in certain foods. Few individuals are expert enough to distinguish poisonous

mushrooms from the edible types, and institutions should serve only the types grown in quantities by commercial producers and sold either fresh or canned.

A few plants used as foods are safe at one time and not at another. The young white shoots of pokeweed frequently are eaten with safety as greens in the early spring, but the later green shoots may cause severe illness. The green leaves of rhubarb may contain enough oxalic acid to cause illness, but the succulent leaf stems are eaten without any untoward effects. Green parts of white potatoes may contain enough solanin to cause illness, and even death. The livers of certain wild animals may be poisonous to man, although the livers of domestic animals are edible. The animal food most often responsible for illness (gastrointestinal complications) probably is mussels from the Pacific coast. Milk sickness or "trembles" of cows is due to the eating of a poisonous plant, white snakeroot, and the milk (or butter) from cows so afflicted may contain enough of the poison to cause acute illness in man. Ergot poisoning is due to using cereals on which a specific fungus has developed. The condition is virtually unknown in the United States.

Foreign Chemicals

Foreign chemicals may be introduced accidentally into foods in various ways. The use of agate and aluminum cooking vessels is not considered to be dangerous. Glass is best for storing highly acid foods (tomatoes, rhubarb). Cadmium, formerly used as a substitute for aluminum in cooking utensils, has caused severe intestinal disturbances. It should not be used for plating ice-cube trays or for soda-fountain pumps carrying syrup or carbonated water.

Food poisoning may result from fruits and vegetables treated with chemicals, especially lead and arsenic, to control molds and insect pests. Illness has been caused by cider due to the arsenic residue on unwashed apples used in its preparation.

DDT and other insecticides are used in airsol bombs as space sprays or as a surface spray when the surfaces are not used for food preparation. Limits are set for residues of insecticides by the Food and Drug Administration. Apples and pears must not contain "more than 7 mg. of DDT per Kg. of fruit." DDT is absorbed readily by fatty foods. The powder form of this insecticide should be labeled and kept away from food in order to prevent confusion with flour or baking and milk powders. It is estimated that a teaspoonful would be fatal. DDT is a skin irritant, partly due to the vehicle kerosene, but it is less poisonous to man than sodium fluoride powder. Neither should be used around food-preparation areas except with caution. In many localities, sodium fluoride must carry a distinctive dye, usually blue. Though unsightly on the floors, it is helpful when blown into crevices and around plumbing floor openings.

Poisons such as the cyanides, sometimes used in polishes for table silver, may cause illness and even death. Enough cyanide may remain upon an incompletely rinsed fork to cause acute illness. Cyanide

polishes are illegal in some states.

Rat poisons must be selected with care, for the chemicals may be carried to foods. At present, the safest seems to be warfarin. Poisoning, trapping and fumigation are the best methods of control. Virus and living cultures should not be used for pest control. Red squill pellets are safer to use around populated areas and are nontoxic to higher forms of life.

All the newer insecticides must be used with caution, particularly around foods and food-preparation areas. This applies to all powders, vapors, dusts and liquid preparations. No product should be used unless the active chemical ingredient is declared on the label.

SPOILAGE AND ITS PREVENTION

If asked, "Why pasteurize milk?," most persons would answer, "To make it safe," forgetting that pasteurization is a method of food preservation which, fortunately, destroys any pathogenic microorganisms that may be present. The method used to preserve a food product will vary with the type of food and the equipment available for processing. Drying is a relatively simple process and demands little in the way of apparatus. Canning with a pressure cooker has great advantages because steam under 15-pound pressure for 20 minutes ensures sterility. Frozen foods show

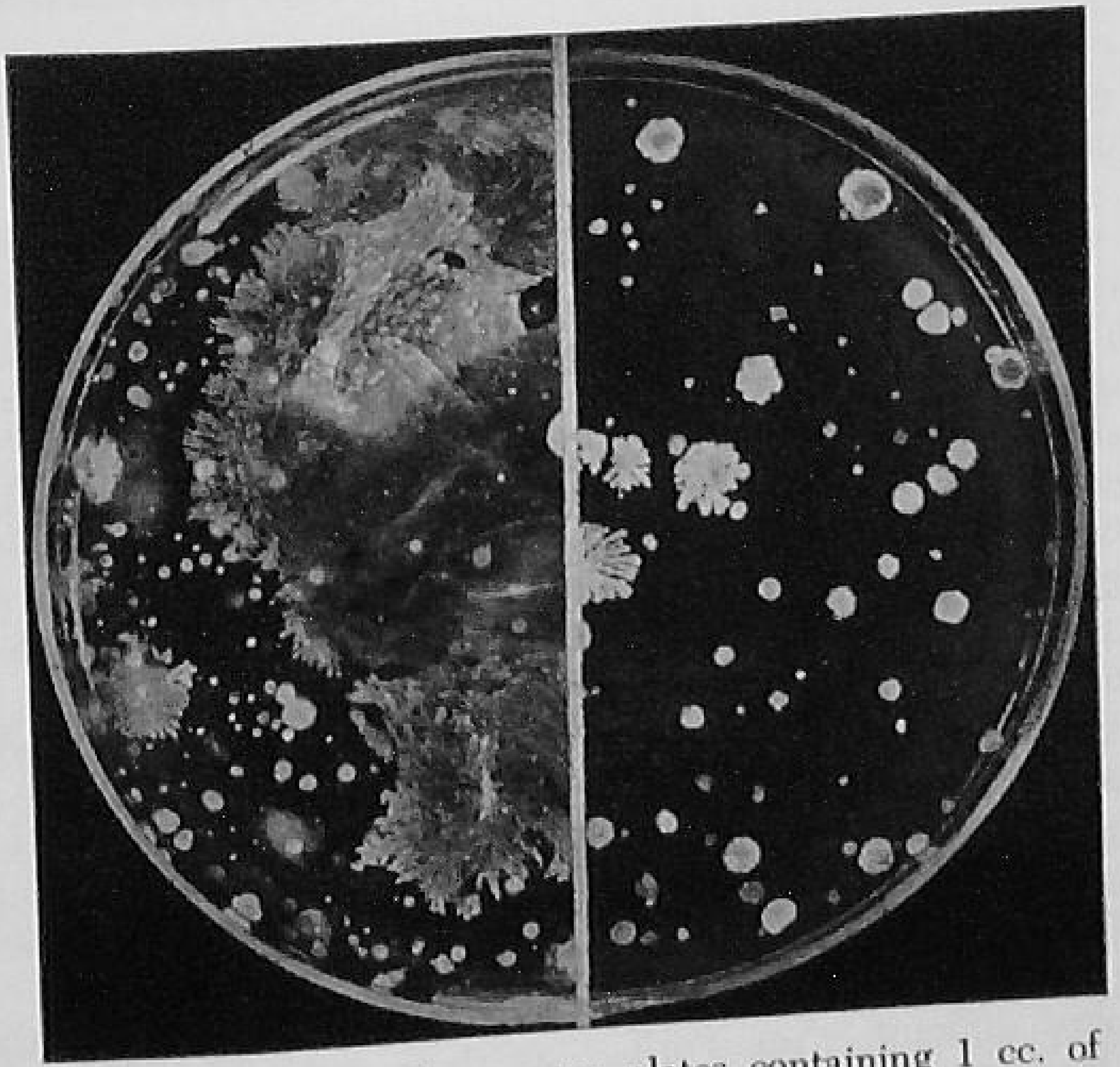


FIG. 45. Parts of two agar plates containing 1 cc. of the water used as the first wash water of two different heads of lettuce. The leaves after this washing would retain numerous bacteria, and further removal of bacteria by repeated washings is desirable.

FIG. 46. This bread offered for sale in Tunisia, North Africa, is in great contrast with our present paper-wrapped loaves of bread. Notice the cut pieces that are left unprotected so that the customer may feel them to determine their freshness.

little change in flavor or texture, and when held under refrigeration retain their original state more nearly than under any other preservation method available.

Foods should be processed as promptly as possible. On many fishing boats now the fish are cleaned, washed and salted at sea. Housewives should can their vegetables as soon as possible after bringing them from the garden or market. Delay may mean the growth of soil bacteria with the development of the spore stage, making their destruction more difficult. (See Packaging and Handling.)

Undesirable changes in foods are not all due to the activity of microorganisms. Contact with oxygen aids the development of rancid flavors. Rancidity or staling may be produced by hydrolysis of fat, as in dairy products, or oxidation of the fat, as in bakery products. Light hastens the discoloration of fruit in glass jars and browns the exposed surface of meats even in the cold-storage showcase. Canned peaches and pears become less firm and tasty even though no bacteria survive. The natural enzymes continue the ripening process in all foods if not destroyed in processing. Most of our food preservation methods have as their main aim the inactivation of all enzymes, the destruction of bacteria, yeasts and molds and the prevention of the germination of spores.

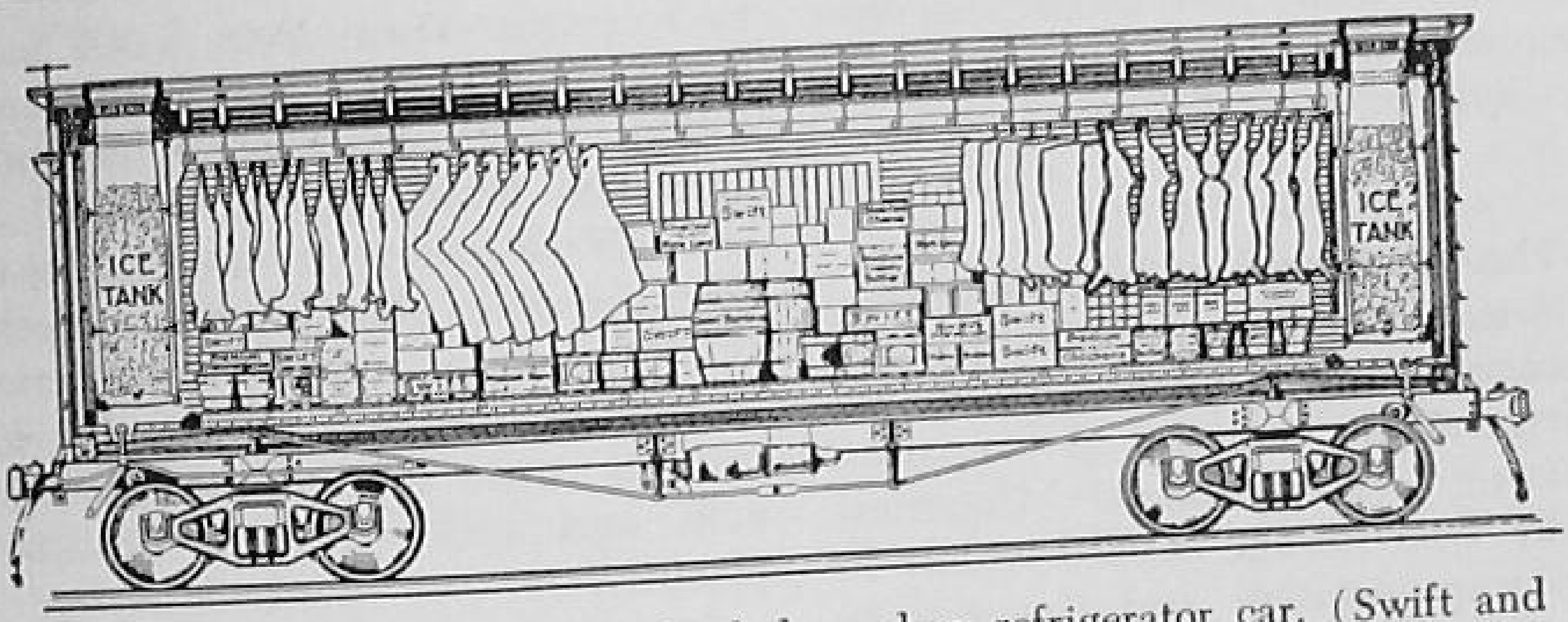


FIG. 47. Interior of view of a loaded, modern refrigerator car. (Swift and Co., Public Relations Department)

Sanitation

Whatever method is used, emphasis must always be placed upon cleanliness and general sanitary conditions. Experiments have shown that the greater the bacterial or the mold content of a given substance, the more difficult it is to secure its complete destruction. Every effort should be made, in ordinary cooking in the home as well as in commercial food production, to avoid contamination of the foods by dust-laden air, dirty utensils and workbenches and soiled hands. Some people laughed when a well-known producer pictured his canners handling pineapple slices with rubber gloves. Today many baked goods and pastries and canned and frozen foods are processed under the same precautions. Unnecessary human contact with foods should be avoided at all times. The excuse, "It is going to be cooked anyway," is not a valid one.

FOOD PRESERVATION METHODS

The methods used for preserving food involve the use of either physical or chemical agents.

Cold

Low temperatures are used to limit the growth of bacteria and molds which cause food spoilage and to kill certain disease organisms, such as worms, which occur in infested pork and beef. Three factors are related to the hygienic condition of the foods in the home refrigerator. One is the maintenance of the desired low temperature. This depends upon keeping the ice compartment well filled or setting the control dial at the specified point and by not raising the refrigerator temperature by leaving the door open or by adding large amounts of hot food. A second factor is the cleanliness of the refrigerator and the materials placed in it. Except for such fragile fruits as raspberries, all fruits should be washed thoroughly before being placed in the refrigerator. Inedible matter, such as earthy particles, roots and leaves, should be discarded before the vegetables are washed. A third factor is the quick turnover in foods. Plant foods lose their vitamins and tenderness, fatty foods become rancid, and milk and cooked vegetables lose

flavor or taste and finally become sour or spoiled when they are held too long in the refrigerator.

Cold Storage

The household refrigerator (45° F.) is a familiar example of cold storage, although modern automatic refrigerators include a separate freezing compartment. Commercially, cold storage is used widely in the transportation and the storage of such perishables as milk, fruit and vegetables. Many fruits and vegetables can withstand temperatures somewhat below 32° F., but this is not necessary for temporary storage. Foods differ in the time period as well as the temperature limits for cold storage; for example, melons, 31 to 32° F. up to 6 weeks; oranges, 32 to 33° F. up to 3 months; bananas, 65 to 70° F. for one week; and butter at 10° F. for 6 months. Commercial food producers utilize various additional aids in cold storage, such as a germicide (sodium hypochlorite, 200 p.p.m.) on the floors, fungicidal paints on the ceilings and the walls, suitable moisture content in the air to prevent the drying of fruits and air circulation to prevent sweating. The successful storage and transportation of cold storage fruits and vegetables are facilitated greatly by modern packaging methods. (See Packaging and Handling.)

Frozen or Frosted Foods

Until the introduction of family food lockers and home freezers, frozen foods were produced commercially, and the hygienic problems were those relating to the handling in the home subsequent to freezing. More than 3,000 food items now are sold in a frozen condition. Quick freezing, which utilizes low temperatures from 0° F. to −25° F., now is more efficient than the older slow-freezing process. It demands a shorter time period in the freezer, and the smaller ice crystals cause less rupture of plant cells and yield a more attractive product.

In freezing foods, certain preliminaries include gross sanitary inspection, the prompt removal of decayed or undesired parts, the evisceration and the cutting of poultry, thorough washing in running water or, better, the use of water sprays under pressure. Preliminary blanching of some vegetables and fruits destroys the natural enzymes and prevents later discoloration. A "flash pasteurization" is given orange juice to control enzyme changes. The frozen product thus obtained when reconstituted is almost equal to fresh orange juice in taste and in vitamin content. A frozen milk concentrate, reduced to one fourth its original bulk, was produced in 1951. It is economical to handle from the standpoint of transportation, and it has good taste and keeping qualities.

The foods to be frozen are chilled in various ways, by cold running water, cold air sprays (fogs) or contact with cold metal plates. Small or family-size units may be frozen quickly in one method of processing by pressing between two cold metal plates. Packing, wrapping and sealing follow as part of a continuous freezing procedure, which reduces the chances of contamination. Even at the low temperatures of quick freezing, all the micro-organisms are

not killed. Experiments have shown that pathogenic and nonpathogenic micro-organisms can persist. Examination of frozen foods show common air and soil organisms, often thousands per gram of food. No disease outbreaks have been traced to frozen foods, not even botulism, for, fortunately for us, the botulinus bacteria do not form toxins at freezing temperatures nor in the human intestine. It is only when foods containing these pathogenic bacteria are kept at warm temperatures that toxins accumulate. Commercial packers freeze food as soon as possible after the crop is harvested.

Meat packers subject pork and beef to a very low temperature for prolonged periods, 5° F. or −15° C. for 30 days, or to a sharper freeze, −18° C. for 24 hours.

The small size of the units of frozen foods for the retail trade expedites freezing and also decreases the possibility that unused food will be left, thawed and so allow micro-organisms to multiply. Refreezing does not overcome the risk. A 1952 estimate of retail frozen food stores showed that half of them did not have any freezers or did not have adequate freezing space and allowed food to stand in the warm store until it was sold or until space became available. Consumers should be alert to the danger of thawed frozen foods, in stores as well as in their homes. Frozen foods should be thawed quickly just before they are needed. In cooking, the frozen food may be dropped into the cooking water while it is still frozen. Fruits, such as peaches, show less discoloration if thawed in the original covering. Since some frozen foods demand a shorter cooking time than fresh ones, care must be taken to avoid overcooking, thus making them less attractive in appearance and in texture. Certain foods (spinach) may be cooked partly before freezing, and many precooked foods are now available—from rice to chicken pie!

Lockers and Home Freezers

Group and community frozen storage plants with individual lockers became popular several years ago, and more than a million locker spaces were reported in 1950. The better type of storage plant provided preparation rooms with running water, where waste parts could be eliminated and the foods washed and packaged. In the newer plants, construction and insulation costs were reduced by having most of the structure underground. Automatic controls brought any desired locker to the ground level. These locker plants are situated at convenient or central areas, but, even so, they cannot now compete with the time advantages or the accessibility of home freezers.

Home freezers have become very popular where homes are provided with electricity. In 1952, there were more than 4,000,000 home freezers in home use. Freezer-owners' associations, which guarantee a continual stock supply of frozen foods, now are advertised widely and are on the increase. The companies supply a freezer or use the one owned by the customer. Several thousand members are reported in New York City alone. (See Packaging and Handling.) Such home freezers have proved to be a great convenience.

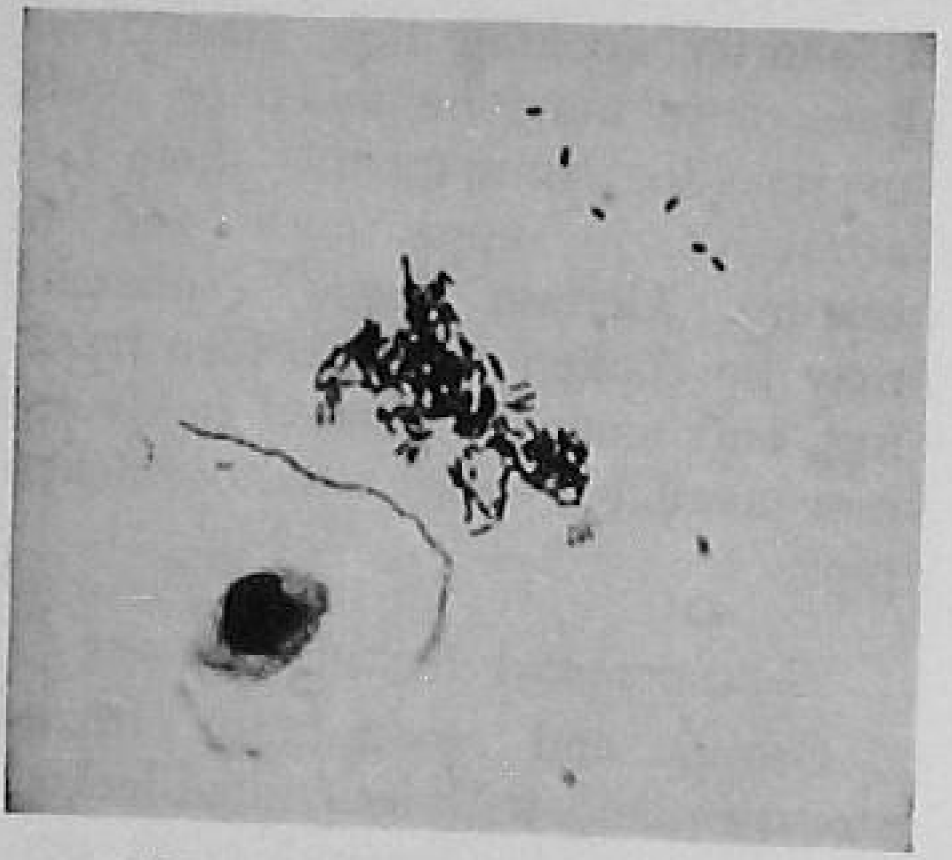


FIG. 48. One field of a microscopic slide of milk stained to show bacteria and one white corpuscle. In this method of direct examination, 1/100 cc. of milk is spread over 3,000 such areas. Estimate the total number of bacteria per cubic centimeter. Could this milk qualify as certified milk?

HEAT

There are several high temperature levels which are used widely to prevent food spoilage and the survival of disease-producing organisms.

Pasteurization now is used for at least 92 per cent of the milk sold in the United States. The holding method utilizes 142° F. to 145° F. for 30 minutes. The high-temperature short-time method utilizes 162° F. for 15 seconds. Each method has a "margin of safety," 10 minutes in the slow or holding method and about 4 seconds in the flash high temperature short time (HTST) method. Careful control of the apparatus is especially necessary in the HTST method. Certified milk comprises a little more than 1 per cent of the milk sold. It may be either pasteurized or raw, but only pasteurized milk now is allowed in some cities. Certified milk is produced under the supervision of a medical committee with special care from tested tuberculosis and abortion-free cattle, and with a guaran-

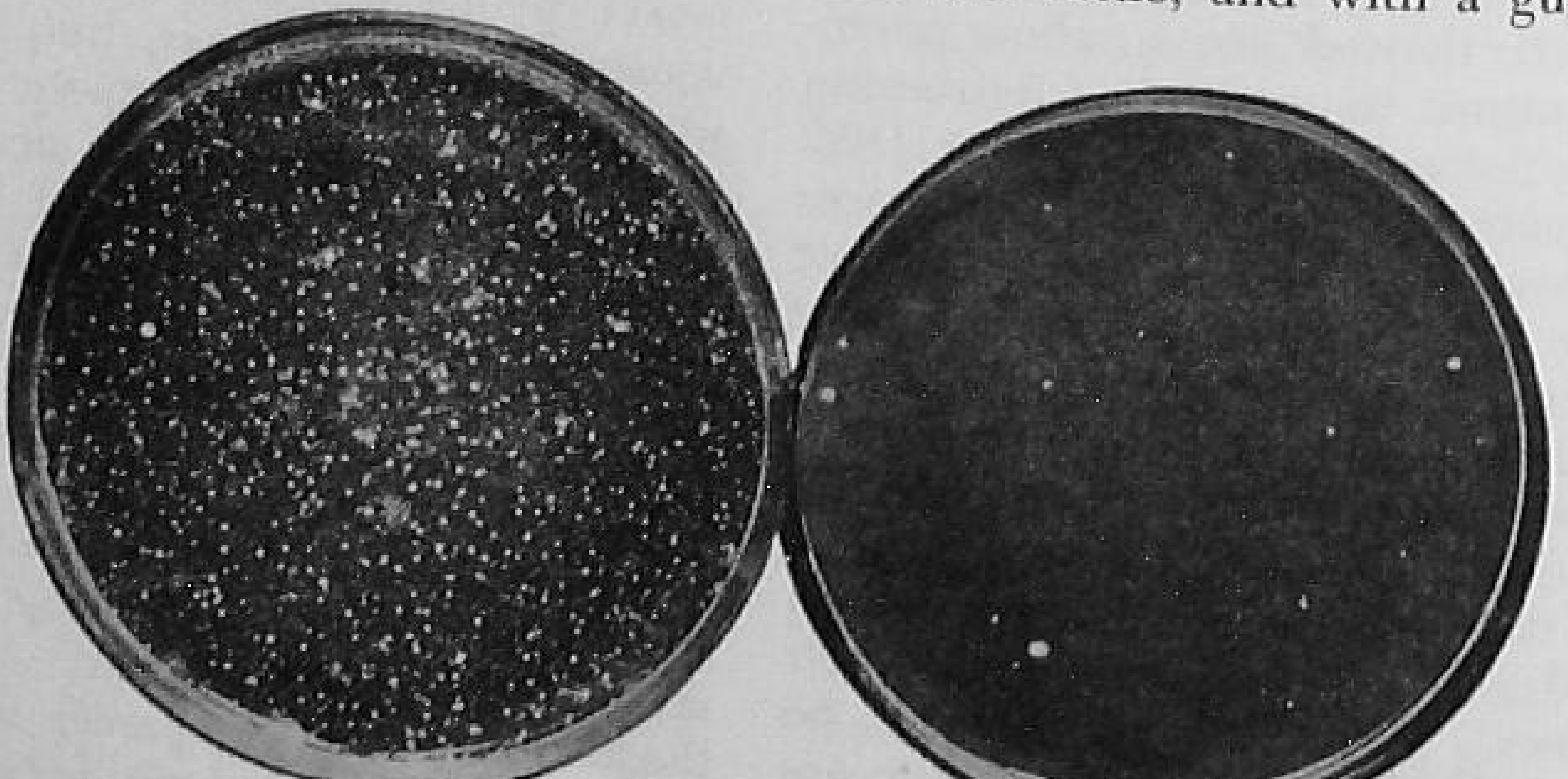


FIG. 49. The benefit of pasteurization is illustrated by the difference in these bacterial colonies developing in these two agar plates after incubation for two days at 37° C. Each contains 0.1 cc. of milk; taken before pasteurization (left plate) and from the same milk after pasteurization (right plate). (Broadhurst and Given: Microbiology Applied to Nursing, Philadelphia, Lippincott)

teed butter fat content and a low bacterial count (less than 10,000 per cc.) when delivered to the consumer.

Milk is tested routinely by local and state health authorities. The larger milk companies conduct more stringent control of their products. Simple chemical color tests (phosphatase test) now are available for determining the presence of raw milk, as little as one tenth per cent, in supposedly safe pasteurized milk. Mother's milk, collected for babies, also is pasteurized and then kept in the refrigerator. Practically all commercial milk products (ice cream, novelties, cheese) are made from pasteurized milk, which ensures their safety.

Homogenized milk is produced after milk has been forced under pressure through a minute aperture in order to break the fat into very fine globules, which will remain evenly dispersed throughout the milk. No cream line forms on standing.

Home canning for nonacid foods, such as peas, corn and Lima beans, requires the use of a pressure cooker. Canning in pressure cookers uses a temperature of 240° F. (121° C.), the temperature of steam under 15-pound pressure. This temperature is held for 20 minutes for pint-size containers to ensure sterility. No botulism has been traced to commercially canned foods since 1927, and few cases have occurred in home canning. In home canning, the cans should be filled while hot, and then sealed. On cooling, this ensures a partial vacuum in the container.

The food in the open kettle method reaches the temperature of boiling water, 212° F. (100° C.), or slightly higher, because of soluble solids such as sugars and salts. The vegetative forms of bacteria are destroyed at this temperature in about 10 minutes, and the spore forms (not destroyed) are unable to germinate at the low *p*H value. This method is suitable only for fruits and vegetables with a *p*H value less than 3.8.

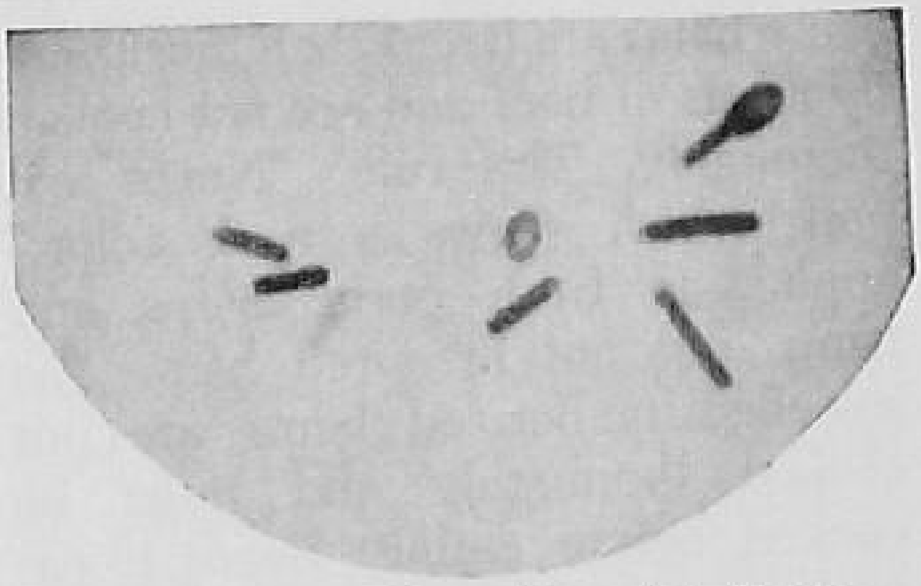


FIG. 50. *Clostridium botulinum* (*Bacillus botulinus*), showing spores as well as the rods or vegetative form. This organism sometimes forms toxins in foods that are incompletely processed and causes the disease botulism.

Home-canned foods which look or smell unusual should be discarded without being tasted. The contents may appear to be quite normal and yet contain enough toxins to cause death. The fatality from such poisoning is from 50 to 100 per cent. It is wise to boil open-kettle, home-canned foods for 10 minutes before using them, for, if any toxin is present, it is destroyed. Toxin can be produced in foods having a *p*H value greater than 5.4.

Baking and roasting use much higher temperatures than boiling. Cookbooks give the recommended temperature and time for specified weights of meat. Pork is cited more often than beef as the cause of food-poisoning outbreaks, probably be-

cause hams are larger than most family roasts of beef and are not cooked thoroughly. The rule, "Never eat pork which shows a pink color," applies to fresh pork, chops and hams, but not to cured ham. The so-called tenderized hams are not cooked thoroughly and must be cooked before eating. Ready-to-eat hams are available, and the meat is so stamped as a safeguard. Large meat loaves should be cooked thoroughly. Other baked or cooked products (ham, crab, chicken for salads) receive no cooking after handling, and contaminated fingers have caused outbreaks of typhoid fever, staphylococcic food poisoning and salmonella infections. The same dangers exist with baked cakes and pastries filled with cream or custard fillings. Regulations which require prompt refrigeration after filling, the prohibition of their sale in warm weather and, less often, the requirement that the filled products be reheated to 425° F. for a short period, help to reduce the sources of infection.

Drying

The simplest and the most ancient method of food preservation is used for cereals, meat, fish and fruits. The discoloration of fruit is lessened by blanching and gassing with sulfur dioxide or dipping in sulphide solution. Foods which contain fats (powdered eggs and whole milk) soon become rancid by oxidation. For that reason, they are purchased preferably in small containers to favor consumption before much oxidation occurs. The moisture content of dry foods should be as low as possible. Salt is added commonly when drying fish.

Dried fruits and vegetables (flaked, powdered) were sold in huge quantities here and abroad in both world wars. Reconstitution takes time, but in mass feeding dried foods are a great factor because of their low cost, small bulk and keeping qualities.

Light

Ultraviolet light sometimes is used to control or destroy spoilage microorganisms resulting from a surface contamination. Since the ultraviolet rays do not penetrate more than a few millimeters below the surface of a liquid, only the surface can benefit by germicidal action. Drinking glasses can be sterilized, the surface of toilet seats protected, the blades used in slicing bread protected from mold spores where the rays reach the desired surface directly.

Chemicals

Preservatives

For many centuries housewives have used concentrated salt solutions (brines) and concentrated sugar solutions (syrups) for preserving food. Vinegar and spices often were added to give variety to the flavor of the products. Vinegar lowers the *p*H value (increases the acidity) and prevents the growth of vegetative forms of bacteria or the germination of spores. Spices contain essential oils and exert a bactericidal action. Salting and pickling do not render foods sterile, though they limit the growth of some bacteria. In sauerkraut, the cabbage is immersed in a salt solution which allows some bacteria to develop and convert the plant sugars into lactic acid. In time, the accumulated acid

interferes with the growth of undesirable spoilage organisms, and added salt increases the osmotic pressure to prevent any bacterial growth. Excessively salty or acid tastes may be removed by dilution with water before using.

Corned beef sometimes is made in the home. A solution of sodium nitrate or sodium nitrite is used to salt down an extra piece of raw beef or to "freshen" frankfurters by maintaining the red coloring. Such corning liquids should be labeled plainly. Recently a cook in a diner accidentally added some corning fluid to the maple sugar used for pancakes. When served to customers and eaten, cyanosis and a rapid pulse developed within an hour and two persons died. The addition of corning fluid to chopped beef to maintain a "fresh" red color is not good practice.

Sodium benzoate and benzoic acid in small amounts, not more than one tenth of 1 per cent, sometimes are used as chemical preservatives. These preservatives are not now permitted (1952) in foods, such as catsups, where the preparation (heat, acids) makes them unnecessary. Their presence in foods must be indicated on the label. A broader term, *Chemical Preservative,* must appear on labels for cheese spreads when vinegar, acetic acid and citric acid are used, if the acidity is below a 5.0 *p*H value.

Fumigation is used mainly to destroy insects and rodents. A common food fumigant, methyl bromide, has good penetrating power, reaching into the middle of large sacks of spices, cereals and other grains. It is often used for trucks, freight cars, bins and storage vaults. Most of the gas disappears within 24 hours, and after aeration the residue is far below the harmful level.

Sulfur dioxide has long been used as an adjunct of drying. It has some antiseptic value when wet, but it is used chiefly as an insecticide. It may be used on cut moist surfaces of potatoes, peaches and pears to prevent discoloration. It is used on wines and fruit juices to delay fermentation. It is not allowed in jellies and jams.

Smoke from burning hard wood (especially hickory) or a synthetic "smoke solution" acts as a surface preservative on smoked fish and hams. The action supplements the earlier salting and sugaring and the attendant drying. The semi-dry smoked surfaces are quite resistant to spoilage organisms, though molds (whiskers) may develop in moist atmospheres. The "Tenderay" process subjects meat to temperatures somewhat warmer than usual (55° F.) in order to hasten the softening (autolytic) action of the natural enzymes while the ultraviolet light is applied to inhibit growth of surface organisms and spoilage. Tenderizing by adding fruit or prepared enzymes (Papain) sometimes is used for beef. The action is checked by refrigeration to avoid disintegration of the tissues. Pineapple juice makes sausage casings more tender and easily chewed.

Chemical Additives

The presence of a chemical in foods in detectable amounts is due, first, to its being an essential or an occasional constituent of protoplasm; second, to its being added inadvertently in processing or merchandising; or, third, to its being

added knowingly for a nutritional value such as the vitamin enrichment of bread, margarine and breakfast foods or as iodine to salt, or for a functional value such as the addition of iron to flour, calcium salts to canned tomatoes, propionate to bread and monosodium glutamate to soups.

These additive chemicals are referred to as wetting agents, emulsifiers, stabilizers, improvers, preservatives, firming agents, humecticants, anti-oxidants, depending upon the function performed in the food product.

Monosodium glutamate, made from beet sugar and sold under such brand names as Zest and Accent, is probably the most common of the substances added to affect flavor, to intensify natural flavors or to offset changes in meats, fish and vegetables caused by overcooking or aging. They are used often in commercial eating places but infrequently in the home. As small an amount as one tenth of 1 per cent by weight affects the flavor of some foods.

Other additives produce desired changes in foods preparatory to canning or pickling, such as the firming action of calcium salts on fruits and vegetables. Other additives may stabilize such a product as French dressing or prevent whitish bloom that develops on chocolate candies or staling in cookies.

The most common of all additives are the antioxidants used to check rancidity in foods containing fats and vegetable oils. Antioxidants include such different substances as citric acid, lecithin, propyl gallate and butylated hydroxyanisole. Antioxidants may be added directly to a fat such as lard during its manufacture, or they may be used on lining wrappers for candies, cookies and butter. An antioxidant in fat is most valuable in preventing staling or an oxidized flavor.

Enzyme additives, mentioned as meat tenderizers, have other functions. Proteolytic enzymes are used to clarify cider and other fruit juices. An enzyme from fungi, alpha amylase, may be kneaded into the dough to improve crust and crumb quality of bread. The use of added chemicals to keep bread soft for several days was prohibited in 1953. Although there is no clearcut evidence that physiologic damage resulted from the quantities used, larger amounts were found harmful in experimental animals. Moreover, bread softeners served to replace some of the fat used in breadmaking, thus decreasing its nutritive value.

Antibiotics

Aureomycin, Chloromycetin and other wonder drugs have been used to promote growth in animals (chickens, pigs), but there is as yet no support for incorporating them in our foods. It is reported that penicillin and other drugs used in the treatment of mastitis in cows interfere in their milk with the lactic acid bacteria needed in cheese production; but no untoward effect has been reported on children or older persons using milk from such treated cattle.

LEGISLATIVE CONTROL OF FOODS

Federal

There are several Federal agencies which deal with foods and, although

the dietitian and the consumer hear very little about them, they operate constantly to keep food quality high and to maintain minimum standards. They are the Food and Drug Administration, the Bureau of Animal Industry, the Bureau of Dairy Industry, the Bureau of Agricultural Economics, the Public Health Service, the Bureau of Internal Revenue and the Federal Trade Commission.

The Federal regulations apply to all imported foods. Theoretically, they apply also to all foods in interstate trade, but any foods that are produced in large quantities or are advertised widely are considered to be designed for interstate trade and must be subject to Federal regulations. Many large production plants find it simpler to make all food processes conform to Federal standards, even though a considerable portion of their products are sold within the state.

The Meat Inspection Act provides for an examination of all animals before slaughter and the postmortem examination of all accepted animals. Carcasses which pass this more detailed examination are stamped "U. S. Inspected and Passed" or "Condemned." Condemned carcasses must be destroyed under the supervision of an inspector. If marked "Passed for Sterilization," the animal may be rendered for fat extraction, or parts of it may be salvaged under supervision and sterilized (240° F.). Inspection also applies to all meat products (fats, sausages) and poultry before release for sale.

The Food, Drug and Cosmetic Act applies to all foods other than meats and covers definitions of adulteration and misbranding which may affect the health of the consumer or the food value or deceive the consumer. How searching these limitations are is shown by the following prohibition of:

1. Any substance poisonous or deleterious to health.
2. Any substance added in excess of authorized allowances.
3. Any valuable constituent lacking.
4. Any substance substituted for it.
5. Any damage or inferiority concealed.
6. Any substance produced under unsanitary conditions and contaminated with filth.
7. Any color added other than certified coal tar colors, except citrus fruits colored according to common practice.
8. Any alcohol in excess of 1 per cent.
9. Any nonnutritive substances, except harmless colors, flavors, glaze and masticatory substances in chewing gum.

State and Local Legislation

In practically all states food regulations conform more or less to Federal regulations, although in some they tend to be less rigorous. Unfortunately, appropriations often are inadequate for inspecting and policing the state regulations; therefore, no action is taken unless a complaint is received. A local board of health may pass more stringent rulings on foods, but it cannot lower the sanitary requirements of the state or the Federal government.

All foods for interstate sale have been considered to be subject to Federal investigation en route (fruit

and vegetables) to food plants, in the factory, and even in wholesale or retail establishments, if complaints suggest the necessity for examining or confiscating the foods. Fortunately, a recent Act of Congress (1953) now permits authorized inspectors of the Food and Drug Administration to enter processing plants upon written notice to the owner, with or without his permission. How far it will affect meat inspectors is not yet clear.

Checks and Tests

Legislation implies methods of testing or checking. Some of these checks are very rigid; for example, not one animal may be killed in the large meat-packing plants before an inspector is on the grounds ready for work. Meat from such plants is again subject to inspection when it is taken from storage for shipment across a state line unless the cars are sealed and opened for inspection upon arrival at their destination. Large plants pay for inspection at rates approaching $10 a carload. The inspection of meats and plant foods may be general (sanitation, refrigeration of the car and general appearance of foods), or it may be more specific; for example, maggots in blueberries, molds in catsups and frozen foods. Competition between producers is an important check on the character of the foods. Many producers (meat, dairy products) support chemical and microbiologic laboratories for the routine checking of their products.

Chemical tests include such tests as the percentage of butter fat in milk and cream or tests for the presence of unusual amounts of forbidden chemical agents. Biologic tests for the number of micro-organisms present in liquids may be made directly by placing a measured amount of the product, such as milk, on a ruled slide. It is then dried, stained and examined under the microscope (Fig. 48). Small amounts may be added to melted agar in a petri plate and the plate incubated for two or three days (Fig. 49).

In a few cases, laboratory animals are used. If an outbreak of botulism occurs, samples of the suspected food may be fed to chickens to see if "limber neck" occurs, or guinea pigs may be injected intraperitoneally with saline extracts of the food.

The budget for inspection and examination of foods rarely reaches the actual needs, especially in state and local communities. The Federal government, however, is ready upon request to send experts to any area where need is apparent.

PACKAGING AND HANDLING

One has to be old enough to remember the corner grocery store with its open cracker barrels and dried-fruit boxes to appreciate the cleanliness of our packaged foods. Packages in great variety are ours—not only tins and bottles but paper and plastics of numerous kinds, reinforced with corrugated pasteboard, strong-fibered to give them wet-strength, laminated for insulation, lined with close-fitting foil to discourage mold or with impregnated paper to overcome oxidized flavors, open-windowed bags or bags consisting wholly of transparent films (cellulose, pliofilm) selected to keep moisture out or to keep it

in, to allow passage of oxygen and carbon dioxide, or to hold in inert gas as nitrogen and inhibit oxidized flavors. Today many of our retail store vegetables carry no trace of mother earth. Spinach, carrots and celery, free from soil or grit, await us crisp and fresh in plastic bags, sealed by a simple twist at the top. Cauliflower and lettuce have been deprived of their outer leaves, and the compact heads are wrapped in aluminum foil for long-distance transportation. All these cans, bottles and packages bear bright labels, often ornamented with gay pictures, and they stand before us "shining as with banners."

Produced at increased costs, in increasing numbers due to commercial competition, and providing the cleanest food we have ever had, what happens in the home, restaurant or other institutions? A few illustrations will suffice. There are many opportunities for bread wrappers to become contaminated by the time the bread reaches the customer, but food handlers thrust the wrapped bread against cut slices in the bread box. The over-edge cap on the milk bottle is discarded and the little circle of pasteboard under it is taken off and pressed down whenever milk is withdrawn, often making numerous contacts of the fingers with the pouring edge of the bottle. Frozen fruits and vegetables are removed from refrigeration and allowed to thaw, the result being bacterial growth and the development of off flavors.

The handling of food—what to do and what not to do—is well illustrated by the photographs in the Ordinance and Code Regulating Eating and Drinking Establishments.[*] Every institution serving food—and in 1952 there were about 500,000 each serving an average of at least three meals a day—should have a copy at hand for the guidance of food handlers.

The problems of food handling can be reduced greatly by single-use articles, not only paper cups and plates but milk and fruit-drink dispensers approved by the U. S. Public Health Service. Sanitation considerations and the present high labor costs make such articles advisable. A drinking glass of such thin glass that it may be discarded is now offered for sale; it can also be washed and reused if desired.

For one phase of food handling the worker is responsible: he should be free from infections and parasitic disease, skin abrasions and any open wounds which could convey infection. If found to be a carrier (typhoid fever), he must refrain from handling foods, even in the home. A second phase, hand washing, at frequent intervals and whenever the hands are soiled, is partly the responsibility of the employer, who should supply warm water, soap and hot air or towels at a convenient location for drying the hands. It is not uncommon for a nurse to travel a long corridor to wash her hands before she can continue her work with her patient.

Dishwashing is an important phase of food handling. Here again the Public Health Service Ordinance

* Ordinance and Code Regulating Eating and Drinking Establishments, U.S.P.H.S. Bull. No. 37, Government Printing Office, Washington, D.C., 25 cents.

gives specific regulations. The dishes should have most of the soil or waste removed with a paper towel or running water. The dishwater should remain reasonably clear. If soap is used, free lather should be present in the wash water. If a commercially prepared detergent is used, the directions for its use should be followed. Simple detergent tests now are available, H-ion paper being used to check the *p*H value. The wash water should be alkaline, *p*H value 10, and at about 135° F. for good cleaning. This step should be followed by a rinse at 170° F. or a hotter temperature. Draining dry is always preferable to towel drying, except for silver and glassware, which may be spotted with minerals in the water and may profit by a final rub with a fresh towel. Towels and dishcloths should be washed after every use and be crispy fresh when used; and towels should be replaced when they become wet. Mops have no place in dishwashing, unless they can be opened to dry throughout and really dried (oven, sun, radiator) promptly after use.

To avoid food spoilage and food-borne disease, sanitary and efficient methods of food production, transportation, storage and final food handling or service must be ensured. Nurses and dietitians should feel confident that the foods they provide will help their patients to regain health, not add to their difficulties.

SUMMARY

1. Most of our food-borne diseases are caused by foods other than milk.
2. Domestic animals and man are frequent causes of food-borne disease.
3. Tuberculosis now is of human rather than of animal origin.
4. Poisons for insects and rodents must be used with discretion.
5. Air, light and natural enzymes affect the quality of canned foods.
6. Time is an important factor in the prevention of spoilage by drying, heat, cold and chemicals.
7. Frosted foods are not sterile and should be defrosted just before they are needed.
8. No food-borne outbreaks have been traced to frozen foods.
9. Cold and other preservation methods may be reinforced by adding chemicals.
10. Chemical additions now are available for improving flavor and texture and preventing oxidation.
11. Legislative control of meat and other foods is exercised in interstate products.
12. Visual checks on foods are aided by chemical and biologic tests and by microscopic examinations.
13. Packaging is now "at a new high"; handling should equal it.

STUDY QUESTIONS

1. List five food-borne diseases. How may each be controlled?
2. Why are more food-borne diseases caused by foods other than milk?
3. What two methods of milk pasteurization are used? Why is milk pasteurized?
4. What is "certified milk"?
5. Describe briefly three methods of preventing food spoilage.
6. Why are state and local regulations necessary?
7. What kinds of checks or tests are made on food products?
8. What does the Federal Food, Drug and Cosmetic Act prohibit?

Part Two

DIET IN DISEASE

Part Two deals with
food as a nutrient and its part
as a therapeutic measure
in the treatment of disease

INTRODUCTION

Contemporary Development of Nursing and Dietetics

History seems to indicate that Florence Nightingale was the mother not only of the nursing profession but of dietetics as well. Her biographer, Sir Edward Cook, reports that when she went to Scutari at the time of the Crimean War in 1854 she was at once confronted with the food problem. Forty-five hundred soldiers were lying on cots in corridors and elsewhere, the sick and the wounded occupying from three to four miles of space. The kitchen for these thousands of men was located at the extreme end of the hospital. It took from three to four hours to serve the ordinary dinner, and there were no facilities for preparing special foods for those who were critically ill. It is reported that within ten days after her arrival, not only had she established two "extra diet kitchens" but she had fitted up an impromptu kitchen on a staircase, and from these diet kitchens 800 men were supplied daily with such foods as chicken broth, arrowroot gruel and other sickroom specialties. In addition, she organized the laundry. Then she went to the battlefront—to the hospital at Balaclava. "She was anxious to inspect these hospitals, to increase the efficiency of the female nurse establishments and, in particular, to introduce those washing and cooking arrangements which had been productive of so much benefit at Scutari."

In her own *Notes on Nursing* and *Notes on Hospitals*, she makes many comments that are still pertinent. After discussing the importance of variety and the proper cooking of food, she says:

"I have often been surprised by the primitive kitchens of some of our civil hospitals with which little variety of cooking is possible. It shows how little diet and cooking are yet thought of as sanitary and curative agents. . . . It is singular that while so much care is taken to provide good medicine properly made up, so little care is bestowed on the cooking of that which is of more importance than most medicines."

The nursing profession from its beginning and until quite recent times was responsible for the dietary work in hospitals. The nurse to whom the special phase of work was assigned was often called a dietist; in fact, this term was used in some branches of government work until recent years. A movement was started about 1890 in some of the hospitals in the eastern

part of this country to place a woman specially trained in foods and in food preparation in charge of the special diet kitchen—at first to teach their nurses how to prepare foods for the sick. A graduate of a cooking school in the East was employed by Johns Hopkins Hospital to instruct its nurses in cooking. She was probably the first resident teacher of sickroom cookery. A little later, in the spring of 1893, the Presbyterian Hospital in Philadelphia decided to start a diet kitchen in which the nurses would be taught to cook and at the same time the patients in the private wards would be given the food prepared by these nurses. This diet kitchen was presided over by a graduate of another cooking school in the East. She was given the title "superintendent of diet." Just when the word dietitian was first applied to this type of food specialist is not known, but it must have developed within the following ten years.

Threefold Responsibility in Dietary Treatment

It is not surprising, in view of the rapid advancement in the science of nutrition and in the administrative phases of feeding large numbers of sick people, that specialists in this field of knowledge should have invaded the hospital field. Nevertheless, the dietary treatment of the sick is a threefold responsibility that rests upon the medical, the nursing and the dietary departments. Only by good teamwork can the best results for the patient be obtained.

Although the doctor orders the therapeutic diet, and the dietitian translates the order into specific food, it is the nurse at the bedside and in the home who deals with the patient as he eats the food. Often it is she who must interpret the diet to the patient and she who makes changes and substitutions as necessary to meet the patient's individual needs from day to day or after he goes home. The nurse should be able not only to fill a dietary prescription accurately but to observe its effects and report intelligently on them to the doctor. She must also take account of the psychological factors affecting appetite and digestion and make every effort to induce a patient to eat essential foods.

To know foods and to use them as a means of maintaining and restoring health, just as she knows the uses and the effects of medicines, is the big objective in the nurse's study of dietetics. To know how to make variations from the normal diet in diseased conditions, she must know food values so as to be able to keep her patient well-nourished while adjusting to restrictions imposed by disease.

CHAPTER SEVENTEEN

Diet in the Treatment of Disease

THE HOSPITAL BASIC DIET
THERAPEUTIC DIETS AS MODIFICATIONS OF THE NORMAL
LIGHT, SOFT AND FULL LIQUID
HOW MODIFICATIONS ARE MADE
SUPPLEMENTS
EMERGENCY FEEDING
THE EFFECT OF IMMOBILIZATION ON NUTRITION
PSYCHOLOGICAL FACTORS IN FEEDING PEOPLE
FEEDING THE CHRONICALLY ILL PATIENT

GENERAL DISCUSSION

Good diet is a perfect way of curing
And worthy much regard and health assuring:
A king that cannot rule him by his diet
Will hardly rule his realm in peace and quiet.

The above quotation, taken from an old Latin book on medicine, "Regimen Sanitatas Salernitatum," and written about A.D. 1000, expresses an appreciation of diet in the treatment of disease. The ancients wrote the preview, as it were, to dietetics by their acute observations with little but experience to guide them in their judgments. Hippocrates, about 400 B.C., forecast calorimetry when he wrote: "Growing bodies have the most innate heat; they therefore require the most food, for otherwise their bodies waste. In old people the heat is feeble and they require little fuel, as it were, to the flame, for it would be extinguished by much."

Artaeus, a Roman physician of about A.D. 200, described and gave the name to diabetes. He wrote that "diabetes is a rather wonderful but fortunately rather rare disease. It consists of a liquefaction of the flesh and bones into urine. . . . It is just as though the aqueducts were open wide." He further stated his belief that a drug would be found to cure it by controlling thirst. It would seem that the discovery of insulin, discussed in the chapter on diabetes mellitus, fulfilled his prophecy.

How surprised the sailors of old must have been when, after centuries of fear and dread of scurvy, they were able to return from their long voyages well and happy by the simple use of lemons! This was a forerunner of the discovery of vita-

min C, which we now know exists in many fruits and vegetables. Byrd's expeditions to the South Pole would have been impossible had not the dietary needs, especially sources of vitamin C, been planned in advance. The story of the cure of other deficiency diseases is quite as interesting as that of scurvy.

We are now living in a period of medical and nutritional research, the results of which have brought relief to untold numbers of persons and have lengthened the average span of life by many years. A recent article states,[1] "Within modern times irrefutable studies have shown in many parts of the world that diet conditions disease, diet influences growth and development and diet is a decisive factor in determining death rates."

In Part Two will be found an application of the principles of nutrition to the treatment of disease in ways of which the ancients could not have dreamed, since most of the information has been forthcoming within the last half century.

Good food is essential to health. This fact is generally accepted, but it is rarely recognized how frequently the poor selection of food may be a contributing factor to disease. On the other hand, the intelligent use of food in the treatment of disease has become a matter of special interest to the medical and the nursing professions, as well as to dietitians specially trained in the subject. The wide interest evident in diet fads and diet cures makes it all the more necessary for the professional dietary treatment of disease to be sane and scientifically sound.

[1] Mann, G. V., and Stare, F. J.: J.A.M.A. 142:409, 1950.

THE HOSPITAL BASIC DIET

The regular hospital menu should provide a well-balanced diet capable of maintaining a state of good nutrition such as has been discussed in previous chapters. It is intended for ambulatory patients and for those whose condition does not require a so-called special or therapeutic diet. It is often referred to as the General, the House, the Regular or the Full Diet. It is very similar to a normal family menu, and should of course be based on the Recommended Daily Food Allowances.

The pattern dietary on the next page constitutes the basic pattern on which the general hospital diet should be planned, and it should also be used as far as possible as the foundation for all therapeutic diets, except those used in emergencies or for short periods of time. If for any reason the diet is lacking in any of these essential groups, the inadequacy should be noted and, if possible, supplemented by foods or, if necessary, by vitamin or other medicinal supplements.

It will be noted that the basic dietary pattern furnishes most of the nutrients recommended by the National Research Council, with the exception of calories. It is assumed that when the menu or the therapeutic diet is planned, "other foods" as desired and as indicated by the specific requirements of the patient will be added. For example, cream and sugar may be served with the breakfast cereal, and coffee or other beverages may be served with the three meals, either with or without

Evaluation of a Pattern Dietary for Its Nutritive Content[1]*

Food Group	Amount in Gm.	Household Measure	Calories	Protein Gm.	Minerals: Calcium Gm.	Minerals: Iron mg.	Vitamins: A I.U.	Vitamins: Thiamine mg.	Vitamins: Riboflavin mg.	Vitamins: Niacin mg.	Vitamins: Ascorbic Acid mg.
Milk or equivalent[2]	480	2 c.	330	17	.560	.4	770	.20	.82	.6	4
Vegetables:											
Potato	100	1 small	85	2	.010	.7	20	.09	.03	1.0	14
Green, leafy or yellow[3]	100	⅔ c.	26	2	.050	.9	4,385	.08	.16	.7	27
Other	100	½ c.	40	1	.030	.6	80	.03	.04	.3	8
Fruits:											
Citrus	100	1 serving	45	.5	.030	.4	115	.06	.02	.2	45
Other, fresh and canned	100	½ c.	55	.5	.010	.4	95	.04	.03	.2	4
Egg	50	1 medium	80	6.5	.030	1.4	570	.05	.14	.1	...
Lean meat or alternates[4]	75	1 med. serving	285	24	.014	3.1	5,350	.24	.58	5.4	3
Whole-grain or enriched bread	90	3 sl.	240	7.5	.060	1.8	.....	.21	.12	1.8	..
Whole-grain or enriched cereal	20	½-1 c. cooked	80	2.5	.020	.6	.....	.07	.04	.6	...
Butter or margarine	15	1 tbsp.	105	....	.....	....	495	....	....	....	...
Totals			1,371	63.5	.814	10.3	11,880	1.07	1.98	10.9[5]	105
Compare with recommended allowances[6]											
Physically active man (70 Kg.)			3,000	70	1.000	12.0	5,000	1.50	1.80	15.0	75
Moderately active woman (56 Kg.)			2,400	60	1.000	12.0	5,000	1.20	1.50	12.0	70

[1] Calculations from Food Composition Table for Short Method of Dietary Analysis (2nd revision)—Leichsenring, J. M., and Wilson, E. D.: J. Am. Dietet. A. 27:386, 1951.

[2] Milk equivalents mean: Evaporated milk and dried milk in amounts equivalent to fluid milk in nutritive content; cheese, if water-soluble minerals and vitamins have not been lost in whey; and food items made with milk.

[3] Evaluation based on figures for cooked asparagus, broccoli, carrots and green beans.

[4] Evaluation based on the use of 100 Gm. liver, 250 Gm. pork or ham, 150 Gm. fish and 500 Gm. beef, lamb or veal per 10-day period.

[5] The addition of coffee will add approximately 1 mg. niacin per cup.

[6] From National Research Council Recommendations, revised 1948.

* This table is adapted from *A Manual for Teaching Dietetics to Student Nurses*, The American Dietetic Association, Philadelphia, Saunders.

sugar and cream. Jelly with the toast may add pleasure to the meal as well as additional calories. Soup and crackers are desirable additions. Two vegetables may be added, one of them raw, if the patient's condition permits. If not, additional citrus fruit, such as orange or grapefruit juice, is desirable. Desserts also furnish not only calories but other important nutrients as well.

In some hospitals slight modifications in this general diet may be made: for a high caloric general diet the so-called high caloric additions are made to it at mealtime or between meals as "nourishment."

Typical menus for the regular house diet, built upon the above basic dietary pattern, appear along with other standard diets later in the chapter.

The adequacy of the general or basic diet depends on the selection of foods as to their respective nutrients and to the preparartion and the cooking, including the time and the temperatures of these processes. These methods are explained in detail in Part Three.

Another important consideration is the palatability and the appearance of the food as it is served to the patient. Hot foods must be served *hot* and cold food *cold*. The hot foods should be served as quickly as possible after the cooking is finished or the flavor will deteriorate and there will be no appetite appeal. Consequently, the food is not eaten and therefore wasted.

Economy may be necessary in the menu planning, but if carried too far it may lead to losses due to food waste. As far as possible, the likes and the dislikes of patients should be ascertained and menus planned accordingly.

THERAPEUTIC DIETS AS MODIFICATIONS OF THE NORMAL

Modifications of the normal general diet usually can be made to supply the various needs of the body in disease. Modifications may be made chiefly in one or more of the following ways.

1. Methods of preparation.
2. In consistency.
3. In total calories.
4. In one or more of the nutrients.
5. In specific food.

For example, the light or convalescent diet differs from the general or regular diet chiefly in the method of preparing the food, although consistency, which is due primarily to the cellulose of vegetable foods and to meat fibers, is also a factor.

The soft diet, as indicated by the name, is low in roughage and contains some liquids. The full liquid diet consists entirely of foods in the liquid state.

These three diets are the simplest in modification and are usually included in Standard Hospital Diets (see following paragraphs).

Light or Convalescent Diet

A light or convalescent diet is intended for convalescent patients not yet able to take the regular diet and for those with minor illnesses. It must be appetizing and readily digested. The chief difference between this diet and the regular house diet is the method of preparation. The foods are cooked plainly —no fried foods or rich pastries are

served. Other fat-rich foods such as pork (except bacon) and salad dressings are avoided. Bran and coarse vegetables are avoided; also most raw vegetables and fruits. All foods included in the soft and the liquid diets may be served in the light diet. In some hospitals this classification is omitted.

Soft Diet

The soft diet is soft in texture and consists of liquids and semisolid foods. It is an intermediate step between the light and the liquid diets. It is indicated in certain postoperative cases, in acute infections and in some gastro-intestinal conditions.

It is low in residue and is readily digested. Little or no spices or condiments are used in the preparation. It is somewhat more restricted that the light diet, in fruit, meat and vegetables. In some hospitals, only puréed vegetables are served and no meat is allowed.

Full Liquid Diet

Foods in the liquid state are more easily digested because they are so finely divided. In many acute conditions there is need for foods which will digest readily (Chap. 8). The lightest of foods are given—broths, albumin drinks, thin gruels and fruit juices, or lemonade, tea and coffee if the patient is accustomed to them. For postoperative liquid diets see Chapter 32. The liquid diet is prescribed also in acute infections and in inflammatory conditions of the gastro-intestinal tract. However, in prolonged fevers, it may be necessary to give the largest amount of food possible in the most easily digested form. If high nutritive value is desired, milk in some form usually is the basis of the diet. Cream may be added in order to increase the caloric value. Buttermilk or any one of the sour-milk preparations or boiled milk may be used to suit the digestive ability and the taste of the patient. Lactose or corn syrup may be added to give additional calories. High protein feedings can also be given (see Chap. 50). By careful planning the diet may be increased in caloric value to approach the normal, as in the diet in the case of typhoid fever, gastric or duodenal ulcer, and certain postoperative diets. Plain ice cream, fruit ices, junket and plain gelatin desserts are allowed as convalescence proceeds. It is important that, in the liquid diet, feedings consisting of 6 to 8 ounces or more should be given every 2 or 3 hours, during waking hours.

An outline of foods included in hospital standard diets is given in the table on page 238. A comparison of these diets will show how an acutely ill patient may progress from the liquid to the soft, to the light and on to the general or house diet. Typical menus are also given. There is some difference in the practice of various hospitals as to what is included in these standard diets, and the nurse should become thoroughly familiar with the meaning of the terms in the hospital in which she is located.

How Modifications Are Made

In addition to the minor dietary modifications as given in the Standard Hospital Diets, many therapeutic or special diets are necessary in the

TABLE OF FOODS ALLOWED IN STANDARD HOSPITAL DIETS

Type of Food	General Diet	Light Diet	Soft Diet	Full Liquid Diet
Fruits	All	All cooked and canned fruits, citrus fruits, bananas	Fruit juices, cooked and canned fruits (without seeds, coarse skins or fiber), bananas	Fruit juices, strained
Cereals and cereal products	All	Cereals: dry or well cooked, spaghetti and macaroni, not highly seasoned	Same as light diet	Gruels, strained
Breads	All	Enriched and whole wheat bread, soda crackers	Same as light diet	
Soups and broths	All	All	Broth, strained cream soups	Same as soft diet
Meat, fish and poultry	All	Tender steaks and chops, lamb, veal, ground or tender beef, bacon, chicken, sweetbreads, liver, fish	Tender chicken, fish and sweetbreads; ground beef and lamb	
Eggs	Eggs cooked in all ways	Soft cooked eggs	Same as light diet	Eggnogs
Dairy products	Milk, sweet and acid; cream; butter; cheese all kinds	Milk, sweet and acid; cream, butter; cottage and cream cheese; Cheddar cheese used in cooking	Same as light diet	Milk, sweet and acid; cream
Vegetables	All, including salads	Cooked vegetables: asparagus, peas, string beans, spinach, carrots, beets, squash Salads: tomato and lettuce Potatoes: boiled, mashed, creamed, scalloped, baked	Cooked vegetables: same as light diet Salads: none Potatoes: Same as light diet	
Desserts	All	Ices, ice cream, junket, cereal puddings, custard, and gelatin, simple cakes, plain cookies	Same as light diet	Ices, ice cream, gelatin, junket, and custard
Beverages	All	Tea, coffee, cocoa; coffee substitutes; milk and milk beverages, carbonated beverages	Same as light diet	Same as light diet

treatment of certain diseases, as will be shown in the following chapters.

The objectives of dietary treatment are usually one or more of the following:

1. To adjust the diet to the ability of the body to metabolize certain food constituents, as in diabetes mellitus.

2. To rest a particular organ, as when fat is reduced in diseases of the gallbladder.

3. To increase or decrease body weight.

4. To overcome deficiency states by the addition of foods rich in an essential element or food constituent, as, for example, vitamin C in scurvy.

5. To provide for ease of digestion by exclusion or removal of irritating substances or those which delay the emptying time of the stomach, such as fiber, condiments and fried foods. This would apply to diseases of the gastro-intestinal tract.

The following outline will show ways and means of accomplishing these objectives:

Typical Menus for Standard Hospital Diets

General Diet	Light Diet	Soft Diet	Full Liquid Diet
Breakfast Fresh pear Oatmeal with milk or cream Scrambled eggs Buttered whole-wheat toast Coffee with cream and sugar	Orange Oatmeal with milk or cream Soft scrambled eggs Buttered whole-wheat toast Coffee with cream and sugar	Orange juice Oatmeal with milk or cream Soft scrambled eggs Buttered whole-wheat toast Coffee with cream and sugar	Orange juice, strained Strained oatmeal gruel with milk or cream Coffee with cream and sugar
			10 A.M. Eggnog
Dinner Vegetable soup Roast veal Mashed potato Buttered broccoli Tomato salad with French dressing Bread: whole-wheat, rye or white Butter Peppermint stick ice cream Milk	Vegetable soup Roast veal Mashed potato Buttered carrots Tomato salad with French dressing Bread: whole-wheat, rye or white Butter Peppermint stick ice cream Milk	Strained vegetable soup Ground beef Mashed potato Buttered carrots Bread: whole-wheat or white Butter Vanilla ice cream with chocolate sauce Milk	Broth with rice Ginger ale with ice cream Coffee with cream and sugar
			3 P.M. Malted milk or buttermilk
Supper Cream of pea soup with crackers Macaroni au gratin Head lettuce salad with Russian dressing Bread Butter Fruit gelatin Tea with cream and sugar	Cream of pea soup with crackers Macaroni au gratin Head lettuce salad with French dressing Bread Butter Fruit gelatin Tea with cream and sugar	Cream of pea soup with crackers Macaroni au gratin Buttered beets Bread Butter Plain gelatin with whipped cream Tea with cream and sugar	Strained cream of pea soup Plain gelatin with whipped cream Tea with cream and sugar
			9 P.M. Hot cocoa

1. **The total caloric value may be increased or decreased** as indicated below:

Increase in total energy value is needed by patients who for any cause are malnourished or underweight. Extra calories are required also by persons convalescing from an acute illness, or having high basal metabolism and by pregnant women and nursing mothers. Children also must be given more calories per unit of weight than adults.

Decrease in total calories is desirable when the patient is overweight or has a low basal metabolism.

2. **Variations in the balance of nutrients** may be made to meet a number of conditions.

Protein:

(a) **Liberal allowance** is required during fevers, in tuberculosis and other wasting diseases; in peptic ulcers, liver and some kidney diseases and anemia; and during growth, pregnancy and lactation.

(b) **Limited amount** is sometimes advocated in certain kidney diseases.

Fats:

(a) **Fats may be increased** in the diet when underweight or malnutrition exists, as in convalescence.

(b) **Low fat diet** is prescribed in some gallbladder disturbances; in obesity; and in some cardiovascular diseases.

Carbohydrates:

(a) **Starches and sugars** make up a large percentage of the normal diet, but these may be increased further when a high caloric diet is desirable in febrile

conditions; in diseases of the liver; in hyperthyroidism; in nephritis and in uremic conditions.

(b) **Both starches and sugars usually are restricted** in diabetes mellitus and are reduced in cases of obesity.

Purines or purine derivatives usually are restricted in gout.

Minerals:

(a) **Common salt** (sodium chloride) is increased in Addison's disease but restricted in cardiac conditions and in diseases of the liver and the kidneys, when accompanied by edema.

(b) **Calcium and phosphorus are increased** in rickets, osteomalacia, tetany, dental caries and acute lead poisoning.

(c) **Iron is increased** in nutritional and in hemorrhagic anemia and sometimes in pernicious anemia.

(d) **Acid and basic elements** in foods sometimes must be carefully calculated to ensure a predominance of either the basic or the acid elements.

Vitamins: Specific vitamins must be increased in the treatment of vitamin-deficiency diseases and in certain other conditions.

(a) **Vitamin A**—In xerophthalmia and night blindness and certain urinary infections.

(b) **Thiamine**—In beriberi, neuritis, constipation, heart disease, pellagra.

(c) **Niacin**—In pellagra.

(d) **Riboflavin**—In certain eye conditions, pellagra.

(e) **Ascorbic Acid**—In scurvy, ulcer, wound healing and certain infections.

(f) **Vitamin D**—In rickets and osteomalacia.

(g) **Vitamin K**—In certain hemorrhagic conditions.

Water Content: Fluids may be "forced," as in certain types of infections, or they may be restricted when so ordered, as in edema of nephritis or cardiac disease.

Roughage and bulk:

(a) **Little or no fiber** should be given in typhoid fever, in ulceration of any part of the alimentary tract or immediately following operations upon the gastro-intestinal tract.

(b) **Liberal amount of fiber** is prescribed in the treatment of certain types of constipation.

Specific articles of food may have to be omitted when an individual is found to react unfavorably to them. This is known as food allergy.

The above outline shows how modifications may be made from the normal diet to meet special needs in the case of disease. The reasons for these adaptations will be given in the following chapters.

Supplements

Research in the nutritional adequacy of therapeutic diets has been undertaken only recently, but the results clearly indicate need for evaluation of these diets for all nutrients. Spies[2] suggests checking all therapeutic diets and further recommends that if the restrictions are of such a nature that the foods permitted cannot provide the essential nutrients in adequate amounts, these nutrients be supplied by supplements in the form of concentrates. Of course, these can be ordered only by the physician, and every effort must be made to make the diet as adequate as possible.

Spies[2] also calls attention to the per cent of deficiencies in food nutrients which he observed among a large group of patients.

Joliffe[3] emphasizes the fact that vitamin supplements are indicated for persons known to have an in-

[2] Spies, T.: J.A.M.A. 122:501, 1943.
[3] Joliffe, Norman: J.A.M.A. 129:613, 1945.

creased vitamin requirement, as in hyperthyroidism, pregnancy, lactation, fevers and delirium or during periods of unusual physical exertion.

Emergency Feeding

In many emergencies, such as follow abdominal operations, accidents and the inability to swallow, the patient must be kept nourished. In such cases feeding by tube may be necessary.

THE EFFECT OF IMMOBILIZATION ON NUTRITION

Many patients undergo a period of immobilization, either as an effect of their disease, as in chronic poliomyelitis, or as treatment, such as prolonged rest prescribed for tuberculosis patients and for patients in casts. In a study done on four conscientious objectors during World War II, Deitrick and Whedon[4] found increased nitrogen and calcium losses from the body during immobilization, resulting in progressive muscular weakness. It would seem to be important that all patients on prolonged bed rest, even when on routine house diets, have additional protein and calcium foods to offset such losses and prevent or reduce muscle weakness in so far as this is possible.

PSYCHOLOGICAL FACTORS IN FEEDING PEOPLE

Food has a symbolic significance which bears little relation to its caloric or nutritive value. Babcock[5] says, "It is easier to show discouragement through anorexia than it is to explain that one is feeling inadequate and depressed in the presence of a frightening disease or a disheartening experience." The diet may be properly prescribed, prepared and served, but, if the patient does not eat it, no good will be accomplished. The nurse will need to use all her skills in understanding, encouragement and diversion to encourage the patient to eat. She will need patience with the slow eater and with the patient who needs to be fed; and she may be called upon to explain why the use of a certain diet is indicated.

Besides the general effect of illness on appetite, the nurse should appreciate that every patient is an individual with likes and dislikes peculiar to himself, stemming from his cultural and economic background. There should be an understanding and a sympathetic approach to food tastes and habits long since acquired. Many a patient has begun to eat when some special delicacy, possibly a native dish, has been provided; and many a patient has learned to eat new foods after the familiar and well-liked ones were provided first.

It must not be forgotten that the appearance of the food and the tray also may produce a psychological effect which will determine acceptance or rejection of the meal. The economic factor is a matter for consideration if the patient is being cared for in the home. For a discussion of this and other home problems see Chapters 10, 11 and 49.

4 Deitrick, J. E., and Whedon, D.: Am. J. Med. 4:3, 1948.

5 Babcock, C. G.: J. Am. Dietet. A. **28**:222, 1952.

FEEDING THE CHRONICALLY ILL PATIENT

With the increased longevity of our times there is a corresponding increase in the number of chronically ill people. All of the foregoing chapter applies to their care, particularly in relation to getting these patients to eat. It needs to be recognized that a return to self-care and reasonable activity may depend as much on the nutritional care of these patients as on other factors. Goodman[6] says: "The results which can be expected from maintaining or re-establishing a satisfactory nutritional state in older persons and in all individuals with acute and chronic illnesses are gratifying and in many instances actually startling."

STUDY QUESTIONS

1. What are some of the objectives of therapeutic diets? What patients have you observed whose diets illustrate these objectives?

2. In what ways may diets be modified to meet therapeutic needs? Illustrate with the diets of patients observed by you.

3. What is the basic dietary pattern for planning the hospital standard diets?

4. How does each standard hospital diet differ from the others and from the regular diet of well people?

5. Using the basic dietary pattern as a guide, plan a day's menu for yourself, giving the specific foods included in each of the groups listed, also the additional foods necessary to supply the required calories. Plan a similar menu for a patient on a general or house diet, also one on a soft diet. Evaluate all three menus.

6. What psychological factors should be kept in mind in the feeding of patients?

7. What may be expected from the proper nutritional care of chronically ill patients? What is the role of the nurse with such patients?

[6] Goodman, J. I.: Am. J. Nursing 51:165, 1951.

CHAPTER EIGHTEEN

Overweight and Underweight

LIFE EXPECTANCY AND BODY WEIGHT
OBESITY
CAUSES
EXERCISE AND WEIGHT
DRUGS AND WEIGHT
DIETARY CONTROL OF WEIGHT
OBESITY (CONT.)
LOW CALORIC REDUCING DIETS
UNDERWEIGHT
DIET FOR UNDERWEIGHT
HIGH CALORIC DIET FOR UNDERWEIGHT

LIFE EXPECTANCY AND BODY WEIGHT

The question of body weight is becoming a major public health problem. Until a relatively few years ago, public health workers were concerned with the control of communicable diseases and infections. Many of these have yielded to the new weapons of medical science and to persistent health education efforts. As a result, other conditions now are becoming major public health problems. Among these is overweight and, to a lesser extent, underweight.

No one knows how many people in our population are overweight, nor exactly what direct bearing weight has on mortality. But it is known, from studies of life insurance figures, that overweight people develop diabetes, heart disease, high blood pressure, kidney disease and other life-shortening conditions earlier, and are likely to die younger than people of normal weight. They run a greater risk when surgery is necessary and also seem to have less resistance to infections. Complications in pregnancy occur more frequently in overweight women than in those whose weight is normal.

On the other hand, weight too far below normal is not desirable. Underweight people often suffer from fatigue, have poor physical endurance, as well as lowered resistance to infection. Tuberculosis especially is found more often among underweight people than among those of normal weight. Tompkins[1] has shown that markedly underweight pregnant women may present an even greater risk than those who are overweight (see Chapter 12). There seems to be no doubt that more attention should be paid to the important role which correct weight plays in the preservation of health.

The meaning of the terms overweight, obesity and underweight are ill-defined. Armstrong[2] and his co-workers, in a comprehensive article on the subject, based on data from one of our largest life insurance

[1] Tompkins, W. T.: Am. J. Obst. & Gynec. 62:898, 1951.

[2] Armstrong *et al.*: J.A.M.A. **147:** 1007, 1951.

companies, consider variations within 10 per cent above or below average weights as normal, 10 to 20 per cent above average as overweight and more than 20 per cent above average as obesity. Twenty per cent or more below average is regarded as dangerously underweight.

The conception of what constitutes average weight itself has undergone a revision. The older weight tables for adults are based on height and age and allow for an increase in weight with increasing age. Today, for men and women over 25, a fixed set of standards is recommended. This standard is based on the average weight at the ages of 25 to 30 and allows for differences in bodily frame designated as small, medium or large, but not for an increase in weight with age. These tables have been recommended as ideal weights and are now used by many institutions and physicians. Both tables will be found in Part Four, Table 13.

OBESITY

As has already been indicated, obesity is one of the more serious health hazards of our time. Weight control is a positive approach to the maintenance of health and the prevention of some of the major crippling diseases of middle and later life.

Causes

Obesity generally is due to an excessive food intake and sedentary habits. In a small percentage of patients the contributing factor is a disturbance of function of one or more of the ductless glands, such as the thyroid (hypothyroidism) or the pituitary (hypopituitarism). Obesity should not be attributed to glandular deficiencies until the total food intake of the individual has been investigated.

Exercise and Weight

Exercise is important, since it increases the oxidation of the fat. Walking is excellent. A 300-pound man, walking 3 miles per hour, will consume about 330 calories, or the equivalent of 1⅓ ounces of body fat (see Chap. 5). Daily gymnastic exercises are also effective. The only drawback about exercising to reduce is that the appetite is increased and, if entirely satisfied, will more than overbalance the calories lost in exercise. Strenuous exercise may be dangerous for the obese, especially if they are past middle life. The type and the amount of exercise should depend upon the age and the specific condition other than the obesity. In cardiovascular diseases exercise must be limited.

Drugs and Weight

Drugs or proprietary preparations to decrease the weight never should be taken without the consent and the supervision of the physician.

Several drugs have appeared on the market as weight-reduction products. Among the first ones tried was thyroid extract, which, being a natural or physiologic product, was thought to be safe, but it soon proved to be quite the contrary, except in certain well-controlled situations.

Dinitrophenol, which came into the limelight a few years ago as a weight-reducing drug, has been proved to be extremely dangerous

and sometimes fatal in its effect.

More recently a group of drugs, derivatives of amphetamine, have come into prominence. They stimulate metabolism and help to burn the excess fat somewhat faster than would otherwise be the case. They should always be used in conjunction with a low caloric diet and always under the direction of a physician.

Common laxative salts sold under a variety of fancy trade names or laxative drugs sold as harmless remedies all accomplish similar results—the loss of large volumes of water through the stools. The sudden weight reduction is due to loss of water, not fat, and both the water and the resulting weight will be regained promptly as soon as water is consumed. Furthermore, permanent injury to the intestine and the digestive function may result from the repeated use of such drastic treatment. Proper laxative agents have their place in medical practice, but not as obesity cures.

Dietary Control of Weight

Since adipose tissue is a storage for excess fuel food, the caloric intake must be below the actual daily needs if the body is to draw upon and reduce its reserve supply of body fat.

Fuel Value. In planning a reducing diet, the first consideration should be the determination of the fuel value of a normal diet for the individual based on the normal weight for persons of the same height, sex, body build and degree of activity. For adults, this will vary from about 2,000 to 3,000 calories for moderate activity. The fuel value in a reducing diet may safely be cut from one fourth to one half, although it seldom is advisable to go below 1,200 calories unless there is very close medical supervision. A reduction in weight of 1½ to 2 pounds per week usually results from this regimen. This rate of reduction should not be exceeded except on the advice of the physician. Occasionally a physician may prescribe a diet as low as 800 calories, or even less, when the patient is hospitalized or is under constant observation.

Carbohydrate and Fat. Since these two food groups constitute the greatest source of calories in the diet, they must be reduced. However, there is considerable difference of opinion as to whether carbohydrate or fat should be cut to a minimum. The usual low caloric diet will derive approximately half its calories from carbohydrate, as in the normal diet, and reduce the fat intake to a minimum. The advantage of this division is that it follows the natural pattern of carbohydrate intake.

Recently, Young[3] and Cederquist and her co-workers[4] advocated a diet low in carbohydrate and moderate in fat content. They claim that patients find that such a diet has greater satiety value and, therefore, is easier to follow. This will be discussed at greater length later in this chapter.

Protein is needed at all times for repair of body tissues, but when this demand has been met the remainder is used as a source of energy

[3] Young, C.: J. Am. Dietet. A. **28**: 410, 1952.

[4] Cederquist, D. C., *et al.*: J. Am. Dietet. A. **28**:113, 1952.

CALORIC VALUES FOR COMMON "SNACK" FOODS

	Amount or Average Serving	Calorie Count
"Just a Little Sandwich"		
Hamburger on bun	3 in. patty	500
Peanut butter	2 tbsp. P.B.	370
Cheese	1½ ozs. cheese	400
Ham	1½ ozs. ham	350
Beverages		
Carbonated drinks, soda, root beer, etc.	6-oz. glass	80
Cola beverages	12-oz. glass (Pepsi)	150
Club soda	8-oz. glass	5
Chocolate malted milk	10-oz. glass (1¾ cups)	450
Ginger ale	6-oz. glass	60
Tea or coffee, straight	1 c.	0
Tea or coffee, with 2 tablespoonfuls cream and 2 teaspoonfuls sugar	1 c.	90
Alcoholic Drinks		
1 Ale	8-oz. glass	130
1 Beer	8-oz. glass	110
1 Highball (with ginger ale—ladies' style)	8-oz. glass	140
1 Manhattan	Average	175
1 Martini	Average	160
1 Old-fashioned	Average	150
1 Sherry	2-oz. glass	60
Scotch, bourbon, rye	1-oz. jigger	80
Fruits		
Apple	1 3-in.	90
Banana	1 6-in.	100
Grapes	30 medium	75
Orange	1 2¾-in.	80
Pear	1	100
Salted Nuts		
Almonds	10	130
Cashews	10	60
Peanuts	10	60
Pecans	10 halves	150

(Smith, Kline and French Laboratories)

or heat production. Since protein, due to its specific dynamic action, stimulates metabolism more than either carbohydrate or fat, it is evident that it should form a relatively large portion of a reducing diet. One gram of protein per kilogram of normal weight, or approximately 70 Gm. of protein per day for adults usually has been regarded as the normal allowance, but some doctors now advocate a higher intake. Wohl[5] reports better results with an intake of from 1 to 1.5 Gm. of pro-

[5] Wohl, M. G.: Dietotherapy, Philadelphia, Saunders, 1945.

Caloric Values for Common "Snack" Foods

	Amount or Average Serving	Calorie Count
Candies		
Chocolate bars, 5c size:		
Plain	1 bar (1¼ ozs.)	190
With nuts	1 bar	275
Chocolate-covered bar	1 bar	250
Chocolate cream, bon bon, fudge	1 piece 1 in. square	90
Caramels:		
Plain	1 piece ¾ in. cube	35
Chocolate nut caramels	1 piece	60
Desserts		
Pie:		
Fruit—apple, etc	⅙ pie 1 average serving	560
Custard	⅙ pie 1 average serving	360
Lemon meringue	⅙ pie 1 average serving	470
Pumpkin pie with whipped cream	⅙ pie 1 average serving	460
Cake:		
Iced layer—2 layers white cake	1 average serving	345
Fruit—thin slice ¼ in.	1 average serving	125
Sweets		
Ice Cream:		
Plain vanilla	⅙ qt. serving	200
Chocolate and other flavors	⅙ qt., ⅔ c.	230
Milk sherbet	⅙ qt., ⅔ c.	250
Sundaes, small chocolate nut with whipped cream	Average	400
Ice cream sodas, chocolate	10-oz. glass	270
Midnight Snacks for Icebox Raiders		
Cold potato	½ medium	65
Chicken leg	1 average	88
Glass milk	7-oz. glass	140
Mouthful of roast	½ in. × 2 in. × 3 in.	130
Piece of cheese	¼ in. × 2 in. × 3 in.	120
Leftover beans	½ c.	105
Brownie	¾ in. × 1¾ in. × 2¼ in.	300
Cream puff	4 in. diam.	450

tein per kilogram of body weight, as this allows for more meat, fish, eggs and cottage cheese, all of which have a high satiety value. McLester[6] also advises an intake of from 1.0 to 1.5 Gm. per kilogram of normal weight.

[6] McLester, J. S., and Darby, W. J.: Nutrition and Diet in Health and Disease, ed. 6, Philadelphia, Saunders, 1952.

Minerals and Vitamins. Care should be taken to see that the foods supplying calories contain all the other essentials of a normal diet, such as vitamins, minerals and bulk in quantities at least equivalent to those of a normal diet. If the total

calories are very low, supplements such as vitamins and mineral concentrates are indicated.

Alcohol. Since 1 gram of alcohol provides 7 calories, and since many alcoholic beverages contain carbohydrate in some form as well, they should be severely limited or entirely omitted.

Satiety Value of Foods. One of the greatest problems of obese patients is that they are in the habit of eating frequently and in more than average quantities. A glance at the table of "snack" foods on pages 246 and 247 will show how easy it is to add calories without being aware of it. It is essential, therefore, that the low caloric diet be as satisfying as possible. That "all gone" feeling which is so often experienced when the food intake is limited may be so severe as to cause real discomfort and become a strong temptation to overstep the prescribed diet. It has already been indicated that markedly decreasing the carbohydrate intake and allowing a moderate amount of fat may help to solve this problem. Also, protein foods, especially those very low in fat, such as skim milk and cottage cheese taken in limited quantity between meals, may satisfy the feeling of hunger without appreciably increasing the caloric intake. Broth has little food value and may be taken as desired. Fruit gelatins made with saccharine or succaryl may satisfy a craving for sweets. (See Chap. 50 for recipes.)

Water may be taken in moderation with meals, and more freely between meals, unless restricted because of some heart or kidney complications. Sometimes there is retention of water in the tissues, especially when salt is taken in liberal amounts, which masks temporarily the real loss of body fat.

Psychological Factors in Obesity. Many patients who are overweight eat because they have nothing else to do. They may eat when they are under strain or when they feel unappreciated. They may eat because plenty of food denotes prosperity or success in life, quite apart from the physiologic sense of satiety. The nurse or the dietitian must be prepared to give the obese patient a sense of worth by continued encouragement, even when there is occasional failure in holding to the diet. It must be remembered that an individual accustomed to overeating for many years will not find it easy to conform to a rigorous low caloric regimen.

Faddist Diets and Nutritional Adequacy. As has already been stated, it is important that the reducing diet continue to meet the National Research Council standards for adequate nutrition. A glance at the accompanying 1,200 calorie diet will show that this may not be easy. Extremely restricted diets, such as often become fashionable for a time, may take off pounds, but they may also undermine the health of the individual. It is necessary to establish a new pattern of eating, with low caloric menus, especially desserts, that are attractive and satisfying (see Chap. 50 for recipes). Then a person can reduce and stay reduced because he has established new habits. A sound reduction diet should lay the foundation for the individual's food habits and help him to remain within his normal weight limits once he has reached this goal.

Low Caloric Reducing Diet

Principles: To meet all the nutritional needs of the individual except in calories.

Foods Allowed:

Milk	Milk, buttermilk, skimmed milk as permitted.
Cheese	Made of skimmed milk (cottage cheese). Other as permitted.
Butter or margarine	Limited to 3 teaspoonfuls a day or less.
Eggs	Cooked in all ways except fried or otherwise prepared with butter, cream or fat.
Meats, fish, poultry	Lean roast or boiled beef, lamb, veal, pork, chicken, turkey; broiled beefsteak or lamb chops (lean meat only); fish boiled or broiled.
Soups	Clear broths and strained soups.
Bread, cereals, Italian pastes, potato	Whole grain or enriched as permitted. One slice of bread is approximately equivalent to a medium-sized potato or half a cup of rice, macaroni, spaghetti or breakfast cereal, and may be substituted for one of these.
Vegetables	These should be restricted to the 3 per cent, the 6 per cent and the 9 per cent carbohydrate groups. (See Part Four, Table 4.)
Fruits	All fresh fruits and fruits canned without sugar.
Beverages	Milk, buttermilk, skimmed milk as permitted. Coffee, tea or cereal coffee, all without sugar and cream.
Desserts	Fruit as above; gelatin desserts made without sugar.
Condiments	As desired. Saccharine or succaryl may be used as sweetening in place of sugar.

(See some suggested recipes for low caloric diets in Chap. 50.)

Foods to Be Avoided:

Fats	Meat fats, salad dressings, nuts, cream, fried foods, pastries. Butter or margarine as permitted.
Sweets	Sugar, candy, jellies, jams, honey, all sweetened fruits and desserts. Saccharine or succaryl may be used in place of sugar if desired.
Starches	To be limited to those permitted as bread or equivalents.
Miscellaneous	Alcoholic and carbonated beverages, popcorn, all other "snack" foods.

The 1,200 calorie diet on page 251, based on the basic dietary pattern of the preceding chapter, illustrates how modifications of this pattern are made. It will be noted that bread, cereal and potatoes are cut to two servings, and that meat and vegetables other than potato are increased over the basic pattern. The protein of the 1,200 calorie diet may be low for a man who should weigh 70 kilograms or more, and thiamine and niacin are below the National Research Council standards. For this reason, many physicians prescribe vitamin supplements for all patients on reducing diets. A menu for a day for a 1,200 calorie diet follows:

1,200 Calorie, Moderate Protein, Low Fat, Moderate Carbohydrate Diet

Breakfast	*Lunch*	*Dinner*
½ glass orange juice	2 ozs. meat or substitute	2 ozs. meat or substitute
1 egg	Beets	Carrots
1 sl. bread	Asparagus	Spinach
1 tsp. butter	½ sl. bread	Tomato and lettuce salad
½ glass milk	1 tsp. butter	½ sl. bread
Coffee	Strawberries	1 tsp. butter
	1 glass milk	Prunes cooked with saccharin or succaryl
		1 glass milk

A 1,500 calorie diet will be obtained by adding the following foods to the 1,200 calorie diet each day:

2 slices of bread or equivalent.
1 small potato.
1 teaspoon butter or other fat.
A choice of ¾ oz. Cheddar cheese, 3 ozs. cottage cheese or 1 egg.

This diet will meet adequately the National Research Council standards. It is also somewhat higher in protein than the 1,200 calorie diet and may be suited best to the needs of men who need to lose weight and to those who are not markedly overweight.

A 1,000 calorie diet may be obtained from a 1,200 calorie diet by substituting skim milk for the whole milk and omitting 1 teaspoonful of butter or margarine.

An 800 calorie diet is achieved by reducing the 1,000 calorie diet still further by the omission of 1 slice of bread or equivalent, 1 serving of 9 per cent vegetable and 2 teaspoonfuls butter or margarine.

It will be noted that this eliminates all free fat from the diet and allows only one slice of bread or equivalent daily. It must be supplemented with vitamins and should be undertaken only on the advice and under the supervision of a physician.

Low Caloric Diets with High Protein, Moderate Fat and Low Carbohydrate Content. As has been mentioned already, recent work with young college women shows that weight loss can be achieved with diets of approximately 1,400 to 1,800 calories in which a fairly liberal intake of fat (up to 80 Gm.) is included. This type of reduction diet, most of the subjects claimed, did not give rise to the feelings of hunger and weakness so often complained of by patients on reducing diets.

A typical example of this regimen contains 90 Gm. protein, 80 Gm. fat, 80 Gm. carbohydrate and 1,400 calories. (Compare this with the composition of the 1,200 calorie diet on page 251). A menu for a day would be as follows:

(Continued on p. 252)

Composition of a 1,200 Calorie Diet[1]

Foods	Gm.	Approximate Measure	Calories	Protein Gm.	Fat Gm.	Carb. Gm.	Minerals: Ca mg.	Minerals: Fe mg.	Vitamins: A I.U.	Vitamins: Thiamine mg.	Vitamins: Riboflavin mg.	Vitamins: Niacin mg.	Vitamins: Ascorbic Acid mg.
Milk, whole	488	1 pint	332	17	19	24	576	.4	780	.18	.84	.6	6
Egg	50	1	77	6	6	...	26	1.3	550	.05	.14	....	..
Meat, fish, poultry[2]	120	2 med. servings	250	28	16	...	15	2.5	.....	.20	.20	5.6	..
Bread, enriched or whole grain	46	2 sl.	126	4	1	24	36	.8	.....	.12	.08	1.0	..
Butter or margarine	14	1 tbsp.	100	..	11	...	3	....	460	....	....	....	..
Vegetables 9%[3]	200	2 servings	80	2	..	18	56	1.2	8,000	.08	.12	.6	14
Vegetables 3%[4]	300	3 servings	72	6	..	12	180	4.2	12,000	.24	.54	2.1	90
Fruits:													
Citrus	100	1 small orange	45	1	..	11	33	.4	190	.08	.03	.2	49
Other[5]	200	2 servings	140	2	..	36	32	1.8	900	.06	.12	1.2	40
Totals			1,222	66	53	125	957	12.6	22,880	1.01	2.07	11.3[6]	199
Compare with recommended allowances[7]													
Physically active man (70 Kg.)			3,000	70	..	...	1,000	12.0	5,000	1.50	1.80	15.0	75
Moderately active woman (56 Kg.)			2,400	60	..	...	1,000	12.0	5,000	1.20	1.50	12.0	70

[1] Calculations from Table 1, Part Four.

[2] Figures based on composition of round steak, pork (lean), chicken and haddock.

[3] Figures based on composition of cooked beets, onions and squash (winter), and raw carrots.

[4] Figures based on composition of asparagus, cauliflower, spinach, turnip greens and tomatoes.

[5] Figures based on composition of fresh strawberries, bananas, cooked unsweetened prunes, water-pack peaches.

[6] The addition of coffee will add approximately 1 mg. niacin per cup.

[7] From National Research Council Recommendations, revised 1948.

1,400 Calorie Diet—High Protein, Moderate Fat, Low Carbohydrate[7]

Breakfast	*Lunch*	*Dinner*
½ cup orange juice	4 ozs. ground beefchuck, cooked	4 ozs. pork loin roast, cooked
1 poached egg	Baked squash, 1 serving	Canned beets, 1 serving
1 sl. whole-wheat toast	6 ozs. whole milk	Waterpack apricots, 1 serving
1 pat butter		6 ozs. whole milk
½ glass whole milk		

[7] Adapted from Young, C.: Weight reduction using a moderate fat diet, J. Am. Dietet. A. **28**:410, 1952.

Maintenance of Weight Loss. Once the ideal weight has been achieved, the patient should be warned not to return to his old dietary habits and should be helped to maintain his weight at the normal level. This can be done by adding foods, if possible of the patient's own choosing, to his reduction diet so that his energy needs will be met adequately.

UNDERWEIGHT

Types of Leanness. Leanness or underweight may be due to an inadequate caloric intake. A contributing factor may be excessive bodily activity, which increases the metabolic requirements beyond the caloric value of the food eaten. These people are usually of a so-called nervous temperament. Others are weak (asthenic leanness) with muscles poorly developed and lacking in stamina.

Leanness may be due to some other contributing factor within the body, such as malignancy, gastro-intestinal disorders, chronic infectious diseases and endocrine disturbances. An increase in metabolic rate due to hyperthyroidism is frequently a cause of progressive weight loss. In such cases, rest and medical treatment or surgery may be necessary, as well as a high caloric diet.

Underweight owing to malnutrition or an inadequate caloric intake may be a serious condition, especially in the young. Growth is retarded, efficiency is impaired, and resistance to disease is reduced. It has been found that despite the general decrease in tuberculosis in the last few years, the disease has increased among young women between 15 and 24 years of age.

Underweight, like overweight, is a relative term, being based on the average weight for a given height, build and sex. More than 10 per cent below the average usually is considered to be abnormal, especially in persons under 25, and is worthy of medical investigation.

Diet for Underweight

The usual cause of underweight is an inadequate diet, the inadequacy being due to either the quantity or the quality of the food supply. A deficiency in calories, protein or its component amino

acids, minerals or vitamins may produce faulty nutrition with loss of weight. A careful survey of the dietary habits of the patient should reveal such inadequacies. The most common dietary cause is insufficient fuel value or calories to meet the energy requirements. Therefore, calories must be increased. Not only must the normal requirement be met, but an increase of from 400 to 800 calories must be made to allow for storage. Fifty per cent above the normal is sometimes prescribed.

The diet, however, must be built up gradually; otherwise, the patient may not be able to tolerate the sudden increase. Care must be taken to ascertain the likes and the dislikes of the patient and to prepare the food as appetizingly as possible, both as to methods of cooking, and appearance when served. Above all, the patient must be instructed as to the necessity for co-operating by consuming all food served to him. Low-calorie soups, salads and beverages should not be eaten at the beginning of a meal, as they tend to give temporary satiety value and to diminish appetite for the more substantial part of the meal.

Vitamin supplements are sometimes prescribed, especially thiamine chloride, for stimulating the appetite and improving digestion.

The objectives of this diet are:

1. An adequate diet, as prescribed in Chapter 17.

2. Additional calories, which may be obtained by (a) increasing the quantity of the foods listed in the normal pattern, by (b) increasing the carbohydrates and, to some extent, the fats, by (c) frequent feedings to include nourishment between meals and before retiring at night.

3. An increase in protein to approximately 90–100 Gm. for adults in order to combat the deficiency due to previous malnutrition with loss of body tissue.

4. An abundance of vitamins and minerals, especially thiamine.

5. A reduction in bulk, if not needed as a laxative, in favor of foods with higher caloric value.

6. Easily digested foods. Carbohydrate-rich foods are especially indicated, since carbohydrate is both easily digested and quickly converted into body fat. Foods rich in fat may be used to increase the fuel value without unduly increasing the bulk, but they must be used with discretion. Greasy foods will lessen the appetite of many patients, and too much fat in any form is frequently distasteful unless cleverly disguised. The uncooked fats, such as cream, butter and salad oils, are more easily digested than fried foods.

High Caloric Diet for Underweight

Principles:

1. High in caloric value: 25–50 per cent above normal.
2. High in protein: 90–100 Gm. for adults.
3. High in vitamins, especially in the vitamin B complex.
4. Nourishment may be served between meals and before retiring.

Foods Allowed:

Milk	Milk and cream in abundance.
Cheese	All kinds.
Fats	Butter and margarine used freely; all other fats.
Eggs	Cooked in all ways.
Meats, fish and fowl	All varieties; bacon and fat meats are indicated if the patient tolerates them.
Soups	Preferably creamed or thick soups.
Bread, cereals, Italian pastes	All kinds; preferably whole grain or enriched.
Vegetables	All vegetables, including potatoes.
Salads	All kinds; oil dressings especially desirable.
Fruits	All fresh and cooked fruits, jellies, jams and marmalades.
Desserts	Ice cream, custards, tapioca and rice puddings, cake, fruit desserts, other simple desserts.
Beverages	Tea, coffee, cocoa, served with cream and sugar; fruit juices (lactose may be added); malted preparations.
Vitamin concentrates	If ordered by the physician.

(See Chap. 50 for high caloric foods and beverage recipes.)

It will be noted that the above diet is a house or regular diet supplemented with cream, extra butter, high caloric desserts and nourishment between meals.

STUDY QUESTIONS

1. Why is obesity becoming a matter of concern to those in the field of public health?
2. What is the role of the nurse in helping a patient to maintain a reducing diet? What may be some of the difficulties encountered? How can they be met?
3. What equivalents may be substituted for a slice of bread?
4. What are the underlying principles of a low caloric diet?
5. Plan several menus for a 1,500 calorie reducing diet for (a) a man who carries his lunch to work, (b) a man who works nights, and (c) for either of these men on Sundays or holidays.
6. What foods are of value in a low caloric diet to give it high satiety value?
7. What besides diet may be helpful in bringing about reduction of weight? What may be harmful?
8. What are some of the reasons for a person's being underweight?
9. What additions can you make to a regular diet to increase it by 1,000 calories? Use Table 1, Part Four, for determining caloric values.
10. A patient who should weigh 140 pounds is 25 pounds underweight. He says that he eats a lot but just cannot gain weight. What advice would you give him about the diet he should follow? Plan a diet for him for a week.

CHAPTER NINETEEN

Fevers and Infections

FEVERS OF SHORT DURATION
- TYPHOID FEVER
- RHEUMATIC FEVER
- POLIOMYELITIS

CHRONIC FEVERS AND INFECTIONS
- TUBERCULOSIS

GENERAL DISCUSSION

Fever is a condition that is characterized by an elevation of body temperature above normal. It always is accompanied by an increase in metabolism. In most febrile conditions the metabolic rate is increased 7 per cent for each degree Fahrenheit. As a result, the carbohydrate stores are burned, and body proteins are destroyed. There is also a loss of body fluids and salts, especially sodium chloride. In planning the diet for such patients, these factors must be kept in mind.

The advent of the antibiotics has shortened the course of many fevers from weeks to days. Typhoid fever is such an infection, and so is pneumococcic pneumonia. These now can be classed with fevers of short duration such as colds, grippe and influenza. Subacute bacterial endocarditis may run a somewhat longer course, even with antibiotics. Recently, the course of rheumatic fever has been much curtailed by the use of the hormones ACTH (adrenocorticotropic hormone) or cortisone. A fever which may be of short duration, but in that time extremely destructive of body tissues, is poliomyelitis. However, we still have fevers which may last for months, even years, and, therefore, may be classed as chronic. Tuberculosis is the outstanding fever of this type.

FEVERS OF SHORT DURATION

Metabolic Changes. In acute febrile conditions both the energy metabolism and the protein metabolism are increased. The longer the fever lasts and the greater the elevation of the temperature, the greater will be the loss of protein from the body tissues. This will be excreted chiefly in the urine in the form of nitrogen compounds. Body fluids also are lost, as well as the salts or minerals of the blood and the tissues.

Dietary Treatment

Because of the increased metabolism and the destruction of body protein, it will be necessary, sooner or later, to increase both the caloric and the protein intake. But since the digestion is also disturbed, and because the fever is of short duration, it is often advisable to disregard

these needs for a few days in order to lessen the work of the gastrointestinal tract. A liquid diet consisting of 800-1,200 calories, adjusted somewhat to the appetite of the patient, will suffice through the early acute stages of the fever. It is important, of course, that the food should be easily digested, and that the feedings should be small and frequent.

The liquid diet on page 238 usually is prescribed because the food is digested quickly and easily and is devoid of irritating substances. Another equally important reason is that in this way the fluid intake is increased. From three to four quarts of liquid per day is often prescribed in order to prevent dehydration. Fruit juices, including lemon, orange, pineapple, tomato and grapefruit juices, are given frequently. Tea and coffee (not too strong) with cream and sugar may be given two or three times a day. Carbonated beverages may often be used to lend variety and to increase fluid consumption.

Broths and strained soups are important for their stimulating effect and as conveyors of salt (sodium chloride), which will be used to replace body losses of this substance as well as fluids.

Milk, of course, is an excellent foundation for a liquid diet. Its importance has been noted in previous chapters. The addition of lactose, glucose, or cane sugar not only increases the caloric value but also improves the flavor. Gruels, with or without milk, are easily taken. They are warm and bland and often well tolerated by the very sick patient. Feedings should be given every two hours. During convalescence certain solid foods, such as crisp toast with butter, toasted breakfast cereals (without bran), soft-cooked eggs, baked or mashed potatoes and, later, soft-cooked vegetables may be added. In other words, the liquid diet is followed by a soft diet, later by a light diet, and still later by a normal diet. If there has been loss of weight, it is advisable to give a high-protein, high-caloric diet. If the weight and protein loss has been considerable, the protein intake should be at least two times the normal requirement.

The diet in typhoid fever may differ somewhat from that in other acute fevers in that it should be high in calories and low in residue (see Chap. 24). Milk and cream, malted beverages and gruel or ginger ale with cream are indicated in frequent feedings if the patient tolerates them. Lactose may be added for extra calories. Fruit juices had best be omitted as they tend to distend the typhoid patient. Fortunately, the use of antibiotics has shortened greatly the course of the disease, and it is no longer necessary to keep the patient on this diet for several weeks.

The diet in rheumatic fever should be the same as that in other fevers. In the acute stage, it should be liquid and as high in calories and protein as feasible. If ACTH (adrenocorticotropic hormone) or cortisone is used, the diet may have to be low in salt. Both these hormones tend to cause sodium reabsorption in the kidneys, which in turn causes fluid retention and edema. (See Part Four, Table 7, for sodium content of food.) In the chronic stage, the diet may be general or soft, and, if carditis is present, may be low in sodium. (See Chap. 27 for low sodium diets.)

Poliomyelitis. The incidence of this dread infection has increased greatly in the past 20 years, and, although associated originally with young children, it now strikes people of all ages. The diet in the acute phase is the same as that in fevers of short duration. However, since there may be extremely rapid tissue destruction,[1] protein intake should be at as high a level as it is possible to obtain. In the acute stage, protein supplements may be tolerated better than milk and milk beverages, particularly if there is involvement of the trunk and the neck. Milk may increase the production of mucus in the throat, which is dangerous, because such patients cannot cough. Thin gruels and thinned mashed potatoes sometimes are taken more easily than clear fluids such as tea and broth. Because with cell destruction there are also large losses of potassium from the body, orange juice, which is high in potassium, should be included frequently. (See the suggested diet below.)

It may be necessary to resort to tube feeding in order to meet the nutritional needs of the patient acutely ill with poliomyelitis. Several types of tube feeding will be found in Chapters 32 and 50. To minimize the danger of distention and diarrhea which may occur when a tube feeding is given rapidly, it should be given by drip method from a Kelley flask.

As soon as the disease subsides, and particularly if there is much tissue damage, an attempt should be made to restore good nutritional status. A high-caloric, high-protein diet is indicated, and every attempt should be made to get these patients to eat as soon and as much as possible. A general or soft house diet (see p. 238) plus high-caloric, high-protein beverages between meals, if eaten, will go far toward this goal (see Chap. 50 for recipes).

Fortunately, many poliomyelitis patients recover from the disease

[1] Bower, A. G., et al.: Am. J. M. Sc. **223**:532, 1952.

Liquid Diet for the Acute Stage of Poliomyelitis

Breakfast	Strained orange juice with lactose Hot gruel with sugar and salt Tea with sugar and lemon
10 A.M.	Strained fruit juice with added protein supplement and lactose
Lunch	Hot broth with added gelatin Strained vegetable juice with added protein supplement Lemon ice
2 P.M.	As at 10 A.M.
4 P.M.	As at 10 A.M.
Supper	Strained clear vegetable soup with added gelatin Tomato juice with added protein supplement Grapefruit juice gelatin
8 P.M.	Any of the above
10 P.M.	Any of the above

with little or no permanent muscle damage. These patients will do well on the diet described in the foregoing paragraph and present no further nutritional problems. It is the patients with extensive loss of muscle function who, because of this, are discouraged and may even be resistant to eating, either because it is too much trouble or because they have lost interest in life, who need especial care. They present a challenge to the dietitian and the nurse which must be met constantly and with unflagging imagination. To talk to these patients about the need for eating meets with little success. The trays must be inviting; the food, if possible, of the patient's own choosing, and of such consistency and arrangement that it can be managed without spilling. For instance, fingers may be of more importance than forks in the matter of salads. Dishes with hot water reservoirs beneath them will keep food hot longer than the ordinary dinner plate. All food should be so arranged on the tray that it is easily reached by the patient. If he needs help, it should be given unobtrusively, so as to minimize his need for it. If he must be fed, as with patients in respirators or on rocking beds, the nurse should assume a comfortable position, either sitting or standing, so that the patient will not feel hurried. If the family lives within visiting distance, they should be encouraged to cook and bring some of the patient's favorite dishes and feed the patient themselves if this can be arranged. These patients present nutritional problems of long duration. It is the patience and the persistence of those caring for them in this as in other matters that may restore them eventually to a useful place in society.

CHRONIC FEVERS AND INFECTIONS

The regular afternoon fever, continuing perhaps for a long period of time, is usually the symptom which causes the tuberculous patient to seek medical aid. This elevation of temperature may continue for months and even years, thus becoming, indeed, a chronic condition.

Tuberculosis

Etiology and Symptoms. Of the chronic infections one of the most dreaded is tuberculosis—a malady from which the human race has long been a sufferer. Volumes have been written about it, and it still engages the interest of hundreds of specialists in the medical profession. The infection is due to the tubercle bacillus, which may affect any or all tissues of the body, but the lungs are more commonly affected. Pulmonary tuberculosis is characterized by the elevation of temperature already mentioned, by coughing and expectoration and by loss of weight and strength. Because of the fever, the caloric needs are increased while for the same reason the appetite decreases. The food intake does not keep pace with the need, and weight loss and fatigue result.

Dietary Treatment

Although antibiotics and other medications are doing much to control the progress of tuberculosis, they do not effect an immediate cure. Therefore, the diet continues to be highly important in treatment. There has been considerable difference of

A SAMPLE MENU FOR A TUBERCULOUS PATIENT

Breakfast	*Dinner*	*Supper*
Citrus fruit	Soup, vegetable or cream	Tomato or fruit juice
Cereal, enriched, with milk, half cream, sugar	Meat or poultry	Soup, consommé or cream
Egg and bacon	Potato or substitute	Fish, shellfish or cheese dish
Toast, 2 slices, or muffins	Vegetable, green or yellow, cooked	Vegetable or fruit salad
Butter or margarine	Vegetable, raw, salad	Bread or roll
Jam, jelly or marmalade	Roll or bread	Butter or margarine
Coffee with sugar and cream	Butter or margarine	Sponge cake with ice-cream
	Glass of milk	Tea or coffee with cream and sugar
	Dessert, baked apple or other fruit	
10 A.M.	3 P.M.	9 P.M.
Malted milk made with milk	Eggnog	Hot cocoa with sweet roll or crackers
	Crackers or cookies	

opinion in the past as to what is the best type of diet to prescribe. Very high protein diets have been recommended, and at other times diets high in fat were favored.

Today it is believed that the diet should be moderately high in protein to promote healing and high enough in calories to regain lost weight. When the patient has reached his ideal weight, or slightly above, the high-protein diet should be continued, but the calories should be sufficient only to maintain the weight. For example, a man weighing 70 Kg. but confined to bed should receive from 2,500 to 2,800 calories; if he is an ambulatory patient, this should be raised to from 2,800 to 3,000 calories. It is known that the basal metabolism of the tuberculous patient is increased only moderately, and that destruction of body tissues (protein) is not as marked as in some other fevers. Nevertheless, the protein intake should be liberal, averaging from 75 to 100 Gm. per day for adults.

The diet should include all the foods rich in minerals and vitamins. Calcium is important for the calcification of the tuberculous nodes. Iron is necessary if there has been hemoptysis (hemorrhage from the lungs). Vitamin D is believed to be essential for the absorption and the metabolism of calcium. The B vitamins, having a role in the oxidation of food, should be increased if fever is persistent; they may also stimulate the appetite.

Of the foods especially indicated in tuberculosis, milk stands at the head of the list because of its high content of excellent protein, calcium and vitamins. At least a quart a day should be consumed. This may be taken in almost any form desired. Frequently, the cultured milks, such as acidophilus milk, yoghurt, or even

buttermilk, are digested more easily than sweet milk and have at least the advantage of introducing variety into the diet.

Eggs in moderation are also desirable and may be taken in any easily digested form. Soft-cooked eggs are more readily digested than raw eggs. Meat, fish, poultry and cheese should be used freely in the diet. Fat in the emulsified form is preferable to the free fats; therefore, cream, butter and egg yolks should form a prominent part of the fat allowances. Fruits and the easily digested vegetables should be included because of their laxative properties and richness in vitamins and in mineral salts. If constipation needs to be corrected, further additions of a laxative nature may be made. The food should be simple and easily digested.

It always should be remembered that the appetite of the tuberculous patient is very likely to be capricious, due to the toxic products of the disease. For this reason constant care should be given to the variety and the attractiveness of his diet.

The diet for pulmonary tuberculosis should have the following characteristics:

1. Caloric value slightly above normal, or sufficient to maintain weight at normal or slightly above.
2. Protein 75-100 Gm.
3. Carbohydrate and fat in easily digested form.
4. High in minerals and vitamins.
5. Nourishment between meals and before retiring.
6. It should be on the basis of the light diet (see Chap. 17).

Typical Diet. On the previous page is a day's diet for a patient requiring 3,000 calories and approximately 100 Gm. of protein.

STUDY QUESTIONS

1. A patient has a basal caloric requirement of 1,800 calories and he is running a temperature of 104°. How many more calories will he need because of this temperature? What else will increase his caloric needs?
2. Write a day's liquid diet menu for a patient with an acute fever of short duration.
3. What are the characteristics of the diet used for typhoid fever? Explain the reason for each one.
4. Plan a high-caloric soft diet for a patient with typhoid fever.
5. What problems may be encountered in feeding the poliomyelitis patient?
6. Plan a high-protein, semisoft diet for a patient recovering from poliomyelitis who has difficulty feeding himself.
7. What factors should be considered in the feeding of patients with tuberculosis?
8. Suggest 5 different high caloric in-between meal feedings that a patient may use to increase his caloric intake.
9. What additions can be made to the regular diet to increase the calories?

CHAPTER TWENTY

Deficiency Diseases

GENERAL CONCEPT OF DEFICIENCIES
PROTEIN DEFICIENCIES
HYPOPROTEINEMIA
NUTRITIONAL EDEMA
KWASHIORKOR
DISORDERS DUE TO VITAMIN A DEFICIENCY
BERIBERI AND OTHER DISORDERS DUE TO THIAMINE DEFICIENCY
PELLAGRA AND RELATED DEFICIENCIES
RIBOFLAVIN DEFICIENCY
SCURVY AND OTHER EVIDENCE OF ASCORBIC ACID DEFICIENCY
RICKETS
OSTEOMALACIA
DENTAL CARIES
HEMORRHAGIC DISEASE OF INFANTS
NUTRITIONAL ANEMIA
SIMPLE OR ENDEMIC GOITER
EARLY DIAGNOSIS AND TREATMENT OF NUTRITIONAL FAILURE

GENERAL CONCEPT OF DEFICIENCIES

The recognition of deficiency diseases antedated in most cases discovery of the food deficiency responsible for the clinical picture. Only after a study of the pathologic state resulting from a controlled or measured deficiency of a specific food factor has it been possible to define the functions of that factor in normal tissue. A study of protein, minerals and vitamins should precede and should be reviewed in connection with the study of this chapter. (See Chaps. 4, 6 and 7.)

A deficiency disease or state in the broadest sense is any pathologic or subnormal condition for which some specific food deficiency is wholly or partially responsible. A deficiency disease may involve a secondary infection or metabolic disturbance which makes it difficult to draw a distinct line between types of diseases. A deficiency state may lower resistance to infection, and certain infections and metabolic disturbance may bring about deficiency states by interfering with normal absorption and utilization of nutrients. The latter situation is known as conditioned malnutrition.

Many diseases not classed as deficiency diseases may be aggravated or even initiated by malnutrition. Concepts of this type have come from wartime and postwar findings among malnourished peoples. Increase in cases of intestinal diseases, ulcer and anemia were associated with undernutrition in Holland in the winter of 1944-1945.[1]

While specific deficiency diseases are emphasized in this chapter, mild and chronic deficiencies, more often

[1] Stare, F. J.: Nutrition Rev. 3:225, 1945.

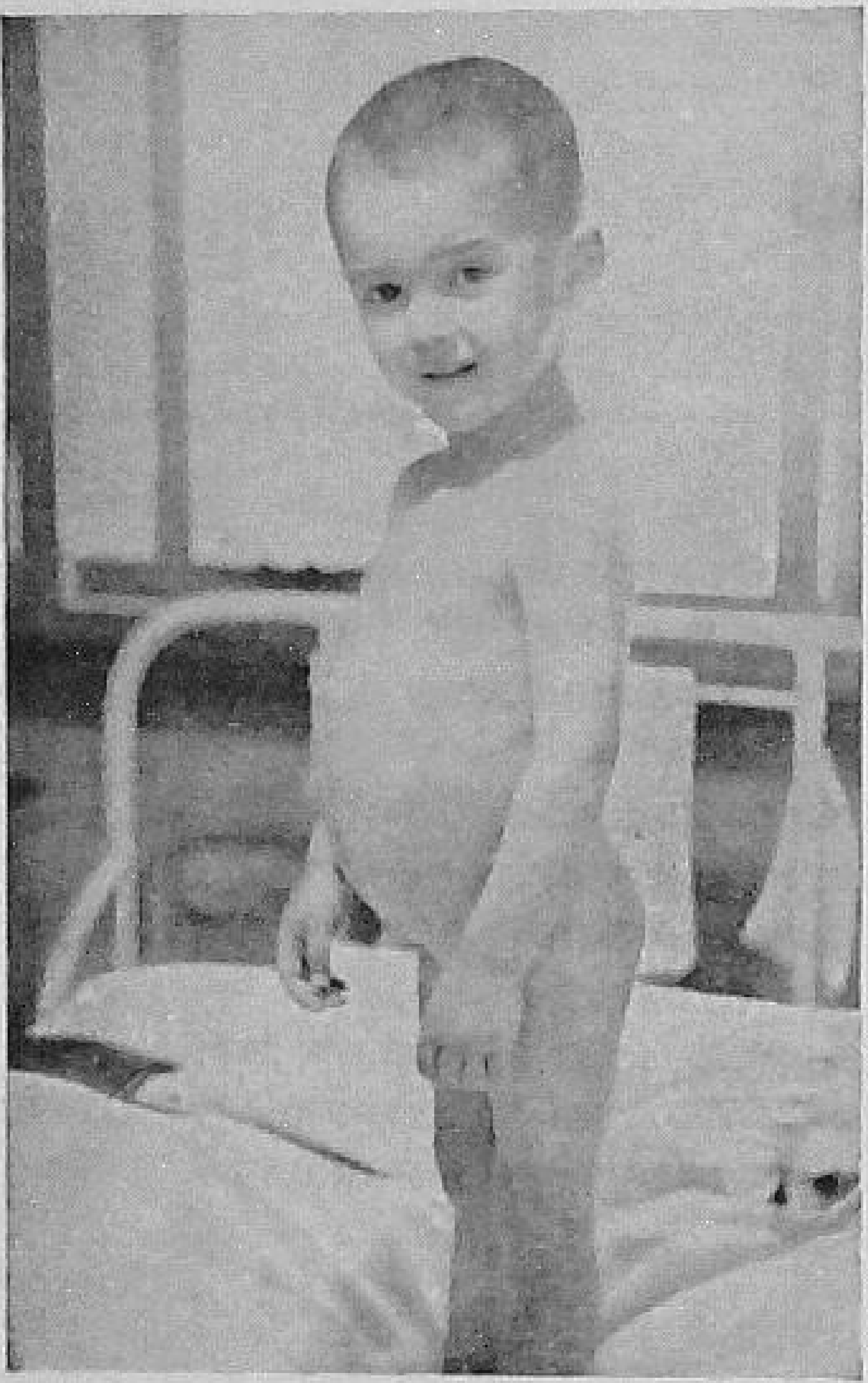


FIG. 51. Malnutrition in a child showing emaciation, protruding abdomen and typical facial expression. (Malnutrition and Starvation in Western Netherlands, 1944-1945, The Hague, General State Printing Office)

encountered as secondary to other conditions, are mentioned also.

Mild and chronic deficiencies are encountered more often than frank deficiency disease. Thus, in this chapter subclinical deficiencies are given consideration along with the severe condition which first brought it to attention.

Underweight and undernutrition due to lack of sufficient quantity of food have been discussed in Chapter 18. Early diagnosis and treatment of nutritional deficiencies are discussed briefly later in this chapter.

Deficiency diseases are frequently the result of multiple deficiencies, and the complex syndrome is difficult to diagnose. Usually, however, a specific disease entity is associated with some one factor more than with others. Such diseases are so classified in this chapter for convenience, but the reader's attention is called to the multiple nature of deficiencies.

PROTEIN DEFICIENCIES

Hypoproteinemia and Nutritional Edema

Incidence. The severe condition of starvation edema is seldom encountered, except during wars or famines, when there are prolonged food shortages. The condition has been reported in the histories of most wars: it was common in Europe in World War I and it was reported again during and since World War II. In the winter of 1944-1945 in nine cities and several smaller communities in North Holland there were as many as 125,000 cases of hunger edema, not including infants.[2]

This report and others from war zones indicated that the occurrence and the severity of the edema were not closely related to the degree of protein deficiency, although the two conditions were associated closely. Typical starvation edema was more apt to be the manifestation of starvation in adults, while in children growth was stunted.

Well-controlled laboratory observations[3] on men restricted to starvation rations have demonstrated the resulting syndrome, the counterpart of which was encountered so fre-

[2] *Ibid.*

[3] Keys, Ancel: J. Am. Dietet. A. **22**: 582, 1946.

quently in war-torn countries. The diet and the treatment most advantageous for recovery also were studied under controlled conditions.

Milder protein deficiency may occur without starvation and actually is a common complication of debilitating disease. It may occur following surgery, wounds and severe burns, and it is not an uncommon accompaniment of gastric ulcers and liver and kidney diseases. It may also be a complication of pregnancy.

Only recently has science demonstrated the clinical picture of protein deficiency and the several ways in which it may occur.

Youmans[4] lists the following conditions as causes of protein deficiency:

1. Deficient intake of protein as related to quantity and to quality (essential amino acids).

2. Failure of absorption or utilization, as in gastro-intestinal diseases.

3. Abnormal destruction or loss from the body, as in nephrosis, when large quantities of albumin are excreted by the kidneys, and in severe burns, when the exudate continues for some time.

Youmans also points out the importance of the caloric intake when he says:

> Of almost greater importance in some cases than the actual amounts of protein is the caloric intake. This is because protein is burned for heat (calories) in the absence of sufficient fat and carbohydrates to supply energy requirements. When the amount of protein in the diet is near minimal, the use of some of it for fuel may make the supply inadequate, and amounts which appear adequate may actually be insufficient.

Symptoms and Pathology. Milder forms of hypoproteinemia, often without edema, may occur anywhere and often accompany other pathologic conditions. The full significance of this condition should be appreciated. Various symptoms such as loss of weight, strength and appetite may be noted, but since these are characteristic of other diseases, it becomes necessary to resort to laboratory tests for reliable diagnosis. The blood may be tested for serum proteins—albumin and globulin—and if these are below normal, the condition is described as hypoproteinemia. At first no obvious clinical symptoms may be noted, but the serum protein may be low enough to delay wound healing after surgery or recuperation from other diseases.

Urine tests may reveal a seepage of albumin into the urine, which of course is a source of depletion of the body protein, since a loss of 1 Gm. of albumin indicates a loss of 30 Gm. of body tissue. Nausea and vomiting also may result in the loss of protein through decreased intake.

Severe hypoproteinemia with or without edema is most apt to occur under war and famine conditions. Edema accompanying prolonged starvation has characteristics of clinical significance. According to Youmans:

> The edema, although not the earliest result of protein deficiency, in our present state of knowledge is about the first clinical sign of the deficiency. One of the characteristics of the edema is its lack of association with symptoms suggesting other causes of edema, notably heart and kidney disease. . . . The

[4] Youmans, J. B.: J.A.M.A. 128:439, 1945.

edema is strikingly dependent on posture, confined to or greatest in dependent parts and, especially in the mild or early stages, shifting from part to part with posture, present in the hands and face in the morning and in the legs at night.

In the mild form the edema is usually painless and bilateral, and develops gradually. There may be an increase in weight, any loss of body tissue being masked by the edema. Weakness, lassitude and mental depression are common, and there is likely to be polyuria, especially nocturia. When other disease symptoms are present they are apt to overshadow those due to protein deficiency.

Children deprived of adequate food with protein markedly deficient become emaciated and growth is definitely retarded. Occasionally, they show some evidence of edema, but it is less marked than in adults. Even after they have been receiving adequate food long enough to have regained average weight for height they may still be under height for their age. One relief worker reported surprise upon learning that a little fellow who appeared to be about 8 years old was actually 12, and this happened repeatedly. On the other hand, the facial expression of such children is too mature for their age.

Treatment. An adequate diet with sufficient calories and a liberal quantity of good quality protein at each meal is the ultimate goal in the treatment of either mild or severe protein deficiency. The milder type, which may accompany or follow debilitating disease or surgery, is ignored too often. These patients frequently have poor appetites or cannot eat sufficient food to meet their needs. Even though blood or plasma transfusions have been used to meet the immediate needs of the critically ill, the continuing requirement of the convalescent for good protein at each meal is of utmost importance. This requirement may be recognized but not met when limited budgets of institutions curtail the purchase of adequate protein foods.

After long periods of protein deficiency or starvation, many months may be required to restore depleted body tissues to normal. In practice, it may take some time before such persons can tolerate a fully adequate diet, and certain precautions are necessary. Persons who have been deprived of food or who have had 1,000 calories or less for extended periods have a decreased capacity for food and must be provided with a graduated increase in food of the right kind. The tolerance for fat is usually low, causing diarrhea or increasing that already present. In the rehabilitation of Dutch children in England they were given 1,800 calories the first day, and this was increased to 2,400 only at the end of the first week.

In the treatment of severe emaciation and protein starvation in Europe, Pollack[5] found that extreme cases did not respond well to the use of protein hydrolysates, either orally or intravenously. They did make remarkable recoveries on thick eggnog mixtures made from dried skim milk and dried eggs. In these cases the irritable digestive tract and the weakened heart condition made the body incapable of tolerating the hydrolysate, which theoretically should have

[5] Pollack, H.: J. Am. Dietet. A. 23: 410, 1947.

been beneficial. The bland milk-egg mixture high in protein was better tolerated and brought results. Blood and plasma transfusions were also given as an emergency source of protein.

Kwashiorkor

One of the most widespread nutritional disorders in tropical and subtropical areas is a syndrome at present ill-defined but considered to be a deficiency disease. It is known by various names, such as kwashiorkor, malignant malnutrition and polydeficiency disease. The dietary analysis, though admittedly crude, has focused attention upon the important role of protein and its constituent amino acids. Brock and Autret[6] visited a large number of territories in Africa under the auspices of FAO, and their report substantiates and expands earlier evidence of the seriousness of this disease.

In this report, kwashiorkor is described as composed of 5 essential features: Retarded growth in the late breast-feeding, weaning and postweaning ages; alteration in skin and hair pigmentation; edema; fatty infiltration, cellular necrosis or fibrosis of the liver; and a heavy mortality when not treated. The term *kwashiorkor*, meaning "red boy," refers to the loss of pigmentation in the dark-skinned races. While this report is restricted to children in certain areas of Africa, a similar condition occurs in other parts of the world and is often known by the same name.

The authors make several recommendations for the prevention of kwashiorkor. Since it would take many years to provide adequate supplies of animal proteins in these areas, attention is focused upon improving the quality of the protein

[6] Brock and Autret: Kwashiorkor in Africa, FAO Pub., 1950.

Fig. 52. Kwashiorkor in Africa. Note the emaciation and the depigmented hair of child (*right*) compared with normal African hair (*left*); mild changes in the middle child. (FAO and Government of Kenya, from "Kwashiorkor in Africa," Rome)

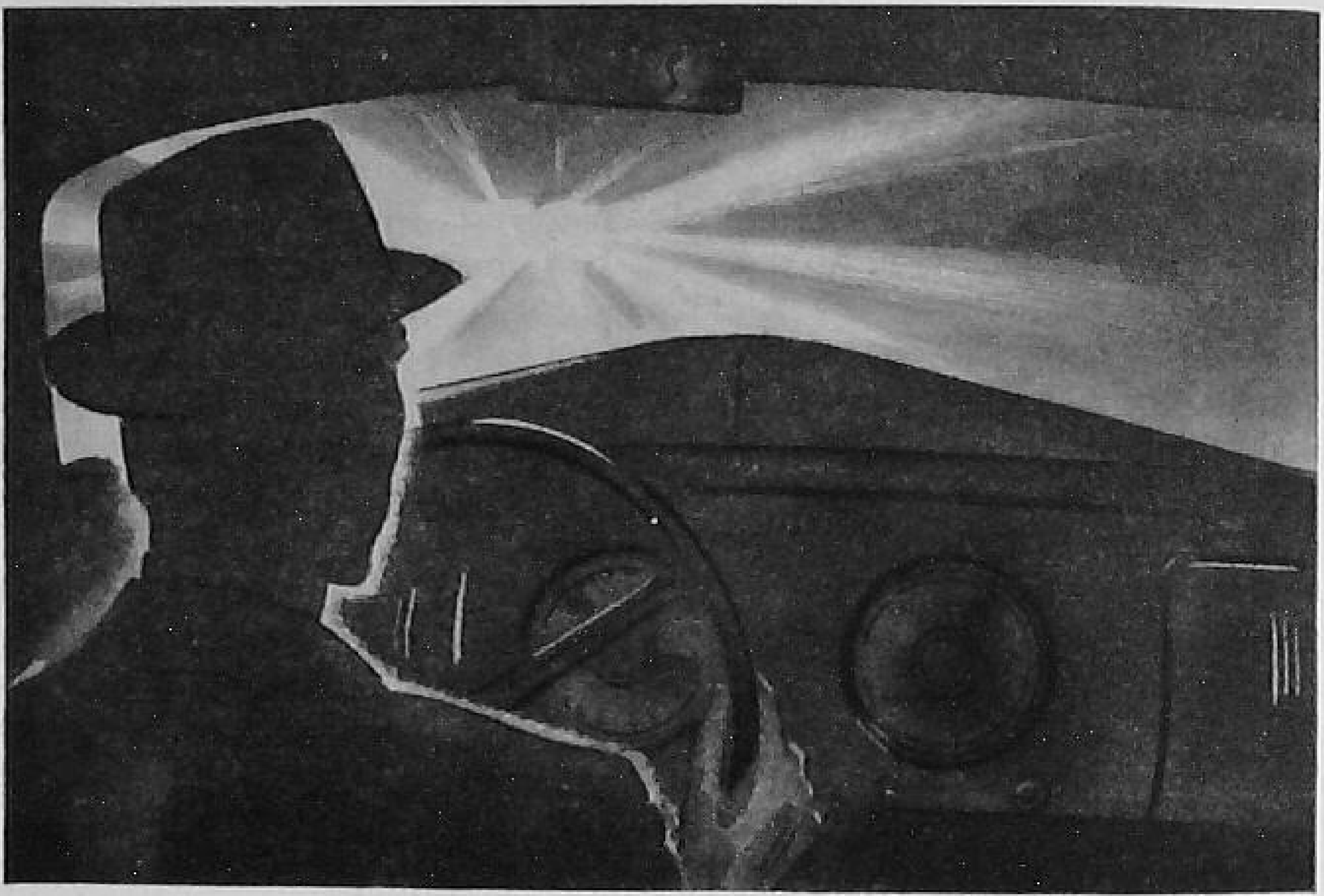


FIG. 53. (*Top*) "Glare blindness" often is a symptom of vitamin A deficiency. Headlights dazzle the eyes and cause discomfort. The driver is blinded temporarily by oncoming headlights, and the edge of the road is seen with difficulty. (*Bottom*) An adequate intake of vitamin A protects against "glare blindness" or remedies it. Properly focused headlights no longer dazzle so blindingly, and the road edge can be seen almost immediately after the headlight glare has passed.

from vegetable origin. Peanuts, soybeans and protein-rich varieties of millet are among the plants giving good yields of protein. The improvement of legumes and other foods familiar to these people is recommended instead of introducing new foods which might not be accepted. In addition to these general suggestions, more suitable supplementary foods for weaning infants, such as dry skim milk powder, are badly needed. Artificial milk from pulses and peanuts, which can be made at home, is also suggested. By means of education and aroused interest some progress is being made.

DISORDERS DUE TO VITAMIN A DEFICIENCY

Night Blindness (Nyctalopia) and Glare Blindness (Hemeralopia)

Incidence. Mild deficiencies of vitamin A with a variety of manifestations are widespread in the world today. One of the early signs long associated with this deficiency is night blindness. In Labrador and in Newfoundland, where this condition has been recognized for generations, the popular remedy is fish liver, which the people rarely eat as food but will take as medicine. Varying degrees of night blindness are discovered among children and adults in this country when instruments for detecting and measuring adjustment to dull light are used for routine examinations of large groups. In general, it tends to be more prevalent among low-income groups, but some cases are found in almost any group.

Glare blindness (hemeralopia), closely related and essentially similar to night blindness, was recognized when automobile drivers complained of being unable to drive at night because of the glare of headlights (Fig. 53). In the course of the war potential night pilots were examined especially for this condition, and a liberal intake of vitamin A was recommended as a preventive.

Etiology and Pathology. Both nyctalopia and hermeralopia are functional disorders resulting from the slow regeneration of visual purple in the retina of the eye. The difficulty is usually insufficient vitamin A to combine with the protein of the retina for the regeneration of visual purple, which is bleached to visual yellow under the influence of bright light. Regeneration of visual purple takes place in the dark, but replenishment of vitamin A from the blood stream is necessary to hasten the reaction, i.e., to permit adaptation in the shortest possible time.

Symptoms and Diagnosis. A person may have a mild degree of either night or glare blindness and not be aware of it unless his attention is drawn to it by some circumstance or special test. One person may be slower than another in adjusting to the dull light of a movie theater, but neither is aware of a difference. Of those who find it difficult to drive at night because of headlight glare, some may have a vitamin A deficiency, but there are other possible causes. This is not a condition which causes sufficient discomfort to prompt one to consult medical advice unless it reaches an advanced stage. Various types of instruments have been developed to test for light adaptation, but none of them is entirely

satisfactory. One form of adaptometer is shown in Figure 55.

Treatment. A daily intake of 5,000 I.U. of vitamin A is more than enough to prevent night blindness or any related condition, unless for some reason the person is unable to use this vitamin or convert carotene into vitamin A. Usually, a food source of this vitamin is sufficient to clear up a mild pathologic state, but numerous fish-liver-oil concentrates are available as more potent sources if their use is advised. The fish-liver-oil concentrates containing true vitamin A come in the usual 5,000 or 10,000 I.U. to the capsule. For food sources of vitamin A and further discussion of the subject see Chapter 7.

Xerosis

Incidence. Xerosis, an early change in the outer layers of the eye, may be a manifestation of vitamin A deficiency among lower-income groups. Gross examination in a good light reveals some of the pathologic changes, but diagnosis usually is based upon more careful examination with proper instruments.

Symptoms and Pathology. The first symptoms of xerosis are itching and burning, with a mild photophobia, usually accompanied by redness of the lids and some inflammation. There is probably a secondary infection, but this is not as severe as in xerophthalmia.

Treatment. An adequate food source of vitamin A is usually sufficient as a preventive, but more concentrated sources, as already described, may be prescribed by a physician until the condition has cleared.

Xerophthalmia

Incidence. The more severe manifestations of vitamin A deficiency are rare in this country but relatively common in China and in India. Xerophthalmia is most apt to occur in infancy but is possible at any age. It occurred during World War I in Denmark when most of the dairy products were being shipped out of the country, skim milk only being retained for home consumption. When whole milk was rationed, a pint per day per child, the eye condition was conquered promptly, proving it to have been of nutritional origin.

Etiology. Xerophthalmia is due to a secondary and serious infection of the cornea. This occurs when the protective secretions of the eye are decreased as a result of keratinization of the epithelial cells which follows a vitamin A deficiency.

Symptoms and Pathology. In infants affected with this eye condition, usually there are numerous other evidences of malnutrition, such as stunted growth and anemia. Adults usually develop hemeralopia before the ophthalmic symptoms appear. The cornea becomes dry and lusterless and eventually opaque and soft. This infection, once started, may spread rapidly and destroy the eye before the deficiency can be corrected or the infection conquered (Fig. 55).

Treatment. Obviously, a food source of vitamin A would not be sufficient to cure an acute case of xerophthalmia, and massive doses of vitamin A in the form of concentrates probably would be prescribed by the attending physician. However, food rich in vitamin A

FIG. 54. Vitamin A. Testing for nutritional night blindness. (U. S. Bureau of Home Economics)

FIG. 55. Xerophthalmia, the result of a diet that is deficient in vitamin A. (Marriot, W. McK.: Infant Nutrition, St. Louis, Mosby)

would be adequate as a prophylactic measure.

Other Conditions Due to Vitamin A Deficiency

Cutaneous lesions may appear early in adults and have a characteristic appearance. Papules tend to form around hair follicles on outer surfaces of arms, legs, shoulders and lower abdomen and are described as having a "gooseflesh" appearance. They usually disappear when an adequate food source of vitamin A is provided.

Respiratory-tract infections are often aggravated by a vitamin A deficiency which allows keratinization of epithelial cells in the respiratory passages, thus reducing their natural resistance to infection. Bronchitis, sinusitis, otitis media and pneumonia are all possible consequences of such lowered resistance due to pathologic changes in the mucous membranes. The relation of vitamin A deficiency to the common cold is still an open question.

Genito-urinary tract changes also may occur as a result of vitamin A deficiency. The epithelial cells in the vagina of the female undergo changes which interfere with the normal estrus cycle, and atrophic changes in the testes of the male may result in permanent damage. Urinary calculi have been produced in animals as a result of a vitamin A deficiency and have also been reported in humans in India where diets deficient in vitamin A are common. Time may disclose many other complications due to epithelial-cell changes resulting from this deficiency.

BERIBERI AND OTHER DISORDERS DUE TO THIAMINE DEFICIENCY

Incidence. The frank deficiency disease known as beriberi is of historic significance among the rice-eaters of the Orient and it still occurs. It is described in early Chinese history, and some of the earliest attempts to treat it are reported from Japan and the Philippines. Takaki, a medical officer in the Japanese marines during the 1880's, was alarmed at the number of cases of beriberi—169 on one ship with 25 deaths. He proposed a theory that the food must be at fault and helped plan an experiment to prove it. A special training ship was sent out on a 287-day voyage; the revised ration included more vegetables, meat and "condensed milk" and less rice. There were only 14 cases of beriberi and no deaths on the trip. The 14 men who were sick had refused to eat the meat and the milk. According to the original report, Takaki attributed the improvement to an increase in nitrogen. The experiment, reinterpreted in view of modern knowledge, really demonstrated that foods containing more thiamine protected the men against the deficiency disease, beriberi.

The extreme condition of human beriberi is seldom encountered in North America, except in certain isolated communities where the food supply is exceedingly limited. Such a situation formerly occurred in northern Newfoundland and Labrador, particularly during the winters following poor fishing seasons, when food became scarce and the people

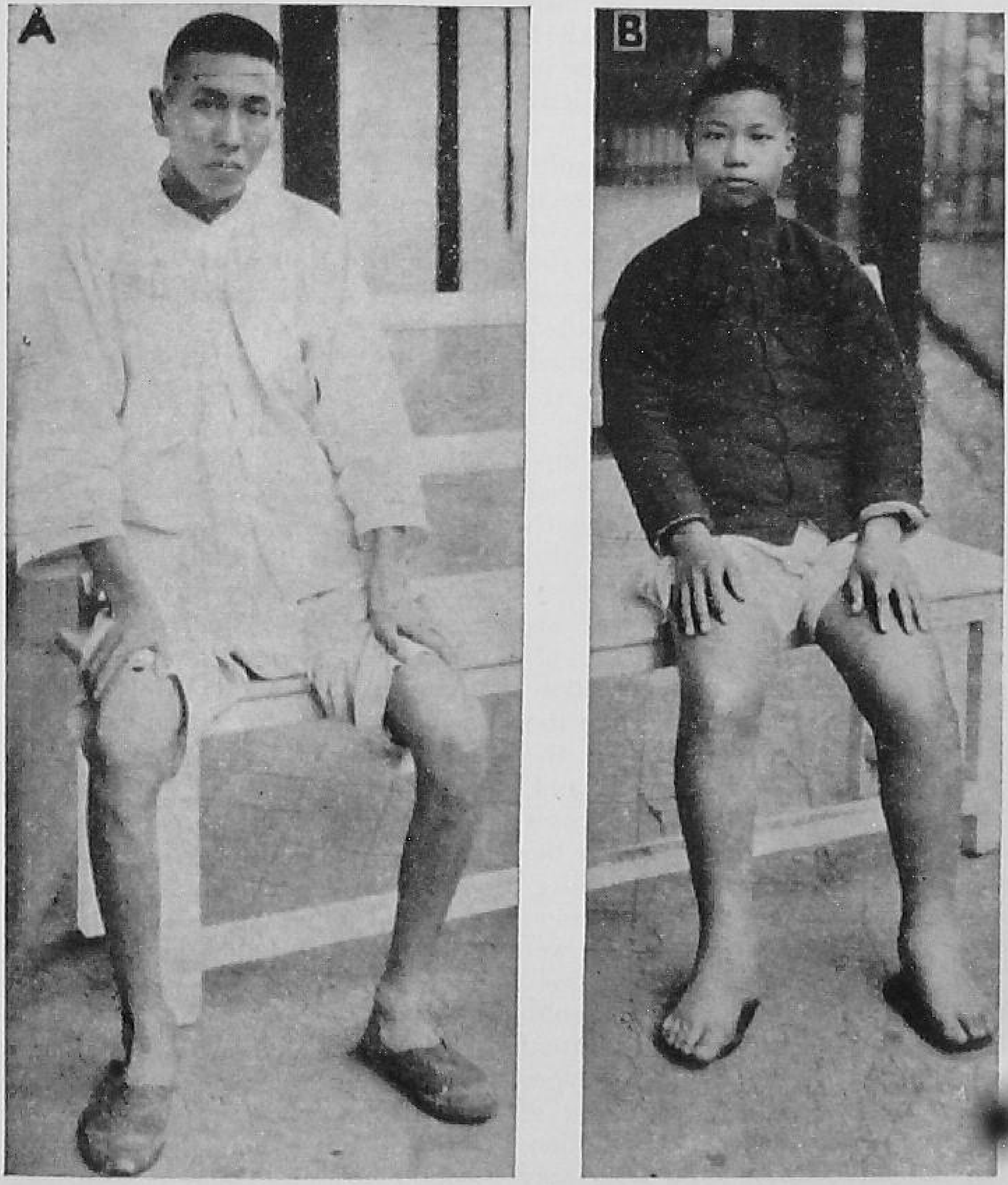


FIG. 56. (A) Atrophic beriberi (dry). (B) Edematous beriberi (wet) with pigmentation and erosions of the skin. (Hoffmann-La Roche, Inc.)

were eating chiefly white bread, margarine, tea and molasses. Then many of the men of a village might be partially paralyzed, usually from the hips down. They developed this condition in the late winter and recovered partially in the spring as soon as fresh game and fresh fish were available. The men seemed to be more susceptible than the women

and the children. Thanks to the program of flour enrichment, since 1944 there has been a marked decrease in the incidence of beriberi. Now it is seldom seen.

Etiology. Beriberi, as such, results only from a long-time deficiency such as may occur among people who eat a limited diet habitually. When the thiamine intake is insufficient but not extremely deficient over an extended period of time, milder and ill-defined symptoms described below may result.

Symptoms and Pathology. Symptoms of beriberi are gastro-intestinal disturbances, such as chronic constipation, due to decreased motility, degenerative changes in heart muscle, and loss of function or paralysis of lower extremities, due to a multiple neuritis. The last condition, which is most disabling, is often the only symptom recognized by the native as a part of the disease and, therefore, many of the milder cases of beriberi which do not reach the stage of paralysis never are diagnosed as beriberi. The two common types of beriberi, known as the wet form and the dry form, are closely related, although they present quite a different appearance to the casual observer (as in Fig. 56). Both types show muscle degeneration, loss of motor function and loss of sensation. In the more acute form fluid may accumulate in certain areas, masking the real emaciation by the edema. In the dry form, which is more chronic, the emaciation is more evident because there is no edema, but the other symptoms are similar. The value of an adequate food supply is generally recognized, but the lethargy and the ignorance of the people among whom these conditions are most prevalent prevent rapid progress in the improvement of food habits.

Less severe or less prolonged thiamine deficiency may be a contributing factor in malnutrition in children and in certain chronic diseases of middle age not ordinarily considered to be of nutritional origin. Since the thiamine requirement is roughly proportional to the metabolic rate, the high-strung nervous individual may need a more liberal supply than a lethargic person. Possible symptoms of a vitamin B_1 deficiency are muscular and nervous fatigue, often vague or ill-defined, with or without indigestion and constipation. Cardiovascular manifestations of this deficiency may respond to the administration of thiamine. There are other manifestations also, such as anorexia and nausea, which are improved by the same factor.

Hereditary differences in metabolism may be responsible for individual variations in requirements for this and other factors. About the only means of diagnosing borderline cases is the improvement noted after vitamin therapy.

Treatment. Adequate food sources of thiamine are sufficient to prevent any of the deficiency conditions described, but when the pathologic symptoms appear more concentrated sources of thiamine usually are necessary for prompt recovery. Anorexia and nausea are often so severe as to preclude an adequate food intake until symptoms have been relieved by the administration of concentrates.

Since most of the cases diagnosed as beriberi in regions where it is

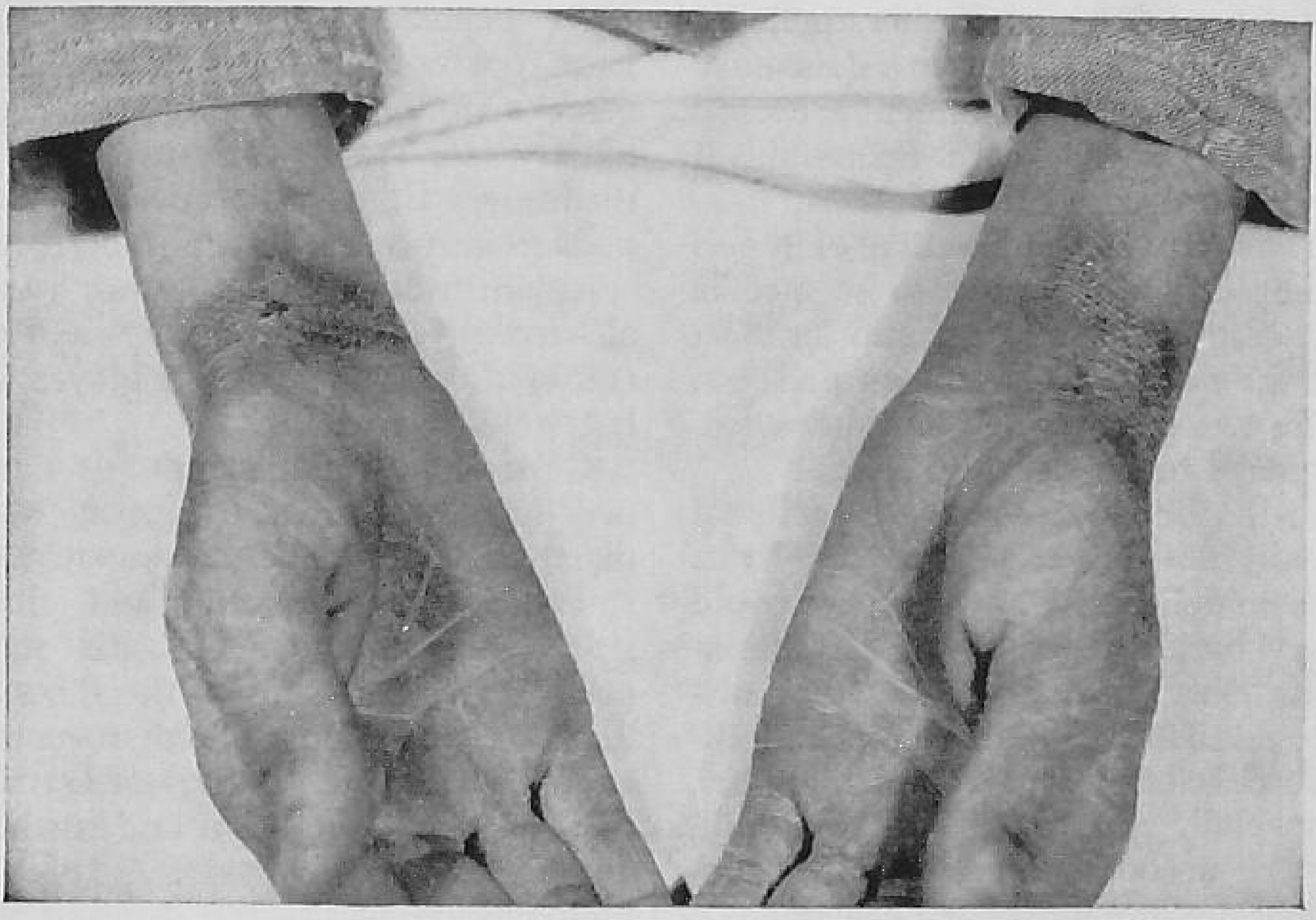


Fig. 57. Bilateral symmetric skin lesions with pigmentation due to niacin deficiency. (Youmans, J. B.: Diagnosis and Treatment of Nutritional Deficiencies, ed. 2, Philadelphia, Lippincott)

prevalent are suffering from multiple deficiencies, it is customary for the physician to prescribe B complex concentrates rather than pure thiamine. The dosage for therapeutic purposes is often several times the recommended allowance of 1.2 to 1.8 mg. of thiamine with other factors in proportion. (See Chap. 9 for recommended allowances of vitamins for different age and sex categories. See Chap. 7 for rich food sources of thiamine and other fractions of the B complex.)

PELLAGRA AND RELATED DEFICIENCIES

Incidence. Pellagra occurs primarily in semitropical countries such as Spain, Italy and southern United States. It is more prevalent among those whose food supply is limited in variety and nutritive value. The incidence of severe cases of pellagra is less during periods of prosperity, and deaths from pellagra have dropped markedly in recent years since advanced cases are hospitalized and given effective treatment. However, pellagra deaths still occur in our southern states.

Isolated cases of pellagra may occur in any part of the country in persons confined to restricted diets. This is more apt to occur when allergy to a number of protein foods limits the diet to a few items. Older people and those with self-imposed restrictions also may show pellagra symptoms.

Etiology. Goldberger first demonstrated that pellagra probably was a

vitamin deficiency. Earlier, pellagra was thought to be due to a deficiency of protein or to an infection caused by eating spoiled corn. Sometimes it was called corn-eaters' disease.

Niacin was the fraction of the B complex which proved to be specific for blacktongue in dogs and for most of the symptoms of human pellagra. The two diseases had long been recognized to be closely related.

All the symptoms of pellagra could not be accounted for by a niacin deficiency, however; nor could they be alleviated by niacin administration. Further investigation disclosed that usually there was a multiple deficiency of B complex factors, especially thiamine and riboflavin, which accounted for certain characteristic symptoms of the disease.

Still more recently investigators have been giving renewed attention to the old corn theory of the cause of pellagra, because the disease is more common among corn-eaters than others. Corn-fed animals show an increased susceptibility to niacin deficiency. Corn is low in niacin and tryptophane, one of the essential amino acids, which is a precursor of niacin in metabolism. Thus, people for whom corn is a major item of diet and who have very little animal protein obtain insufficient amounts of both niacin and its precursor, tryptophane.

Symptoms and Pathology. Pellagra is characterized by skin lesions, gastro-intestinal disturbances and neurologic symptoms. The skin lesions are usually symmetric on the exposed surfaces of arms, legs and neck. They may appear as the earliest manifestation of the disease and look at first like a severe sunburn, later becoming rough and scaly. Since exposure to sunlight aggravates not only the skin lesions but other symptoms as well, it is customary for pellagrins to protect themselves from such exposure. The pellagrous women in a Southern institution visited by the author were all wearing sunbonnets, long-sleeved cotton dresses and cotton gloves in hot summer weather.

Gastro-intestinal symptoms are usually alternate constipation and diarrhea with an accompanying stomatitis (sore mouth) and glossitis (sore tongue). Glossitis suggests the relationship to the disease blacktongue in dogs. Sometimes an anorexia (loss of appetite) or fear of food limits consumption and further aggravates the condition. A lack of hydrochloric acid in the stomach accounts for some of these symptoms and also predisposes the subject to anemia.

The neurologic manifestations may not be recognized early but may develop later into definite mental derangement. The lethargy characteristic of many of the victims may be in itself an early symptom of deficiency. That, combined with ignorance and poverty, has limited the introduction of adequate preventive measures in many areas. As a consequence, there are still many cases of pellagra scattered through the South that are not receiving either prophylactic or curative treatment.

Treatment and Prevention. Severe cases of pellagra now are hospitalized if possible and given multiple-vitamin therapy plus an adequate diet, with the result that they recover in due course. The dosage of niacin and other B complex factors is usually well above the recommended allowance of 12 to 18 mg. of niacin

daily and other factors in proportion. Niacinamide is the form in which this factor is administered when large doses are required.

Pellagrins with early and mild symptoms may never receive medical care or treatment, and education in prevention is slow and often ineffective. Milk, eggs, meat, nuts and certain vegetables would supply the factors missing in the typical pellagra-producing diet of sorghum molasses, corn grits and fat back. A more varied diet is economically prohibitive among the lower-income groups. Nevertheless, educational efforts and other preventive measures among these people have been remarkably effective in reducing the number of cases of pellagra even in flood and in famine areas. Sporadic cases will continue to appear where poverty, isolation and ignorance exist. A Negro educator in talking to his people recommended:

A garden and a cow, a smoke-house and a sow,
Twenty-four chickens and a rooster and you'll live better than you uster.

RIBOFLAVIN DEFICIENCY

Incidence. No well-defined deficiency syndrome or disease with a long history, such as scurvy or beriberi, is associated with a lack of riboflavin. However, studies by Spies *et al.*[7] show that riboflavin deficiency is one of the common clinical nutrition problems especially among infants and children in areas where other deficiencies are endemic. As has already been mentioned, this deficiency is often associated with that of niacin and thiamine in pellagra.

Symptoms and Pathology. Ocular symptoms which appear consistently may precede all other symptoms, with characteristic itching, burning, fatigue and eyestrain. Other clinical manifestations are a shiny red mucosa of the lips with cracking at the corners of the mouth, known as cheilosis, and roughened skin around the mouth and the nose, often accompanied by sebaceous exudate.

Even before clinical symptoms appear a mild riboflavin deficiency may be responsible for a type of light sensitivity or twilight blindness, a condition which does not respond to vitamin A therapy, but does improve with the administration of riboflavin. The physiologic significance of riboflavin is discussed in more detail in Chapter 7.

Treatment and Prevention. Common food sources of riboflavin are listed in Chapter 7, but it is pertinent to emphasize that this factor is perhaps more difficult than other vitamins to obtain in adequate amounts in low-cost diets. Milk and organ meats are the richest natural sources. Enriched bread made with at least 6 per cent of dry-milk solids is also a good economical source. Dry yeast, yeast extracts and other B complex concentrates are frequently prescribed by physicians if there is any indication that the diet cannot be made adequate.

SCURVY AND OTHER EVIDENCE OF ASCORBIC ACID DEFICIENCY

History and Incidence. Scurvy is probably the oldest recognized deficiency disease. Although its specific relationship to ascorbic acid was not

[7] Spies, T. D., *et al.*: Am. J. M. Sc. **200**:25, 1940.

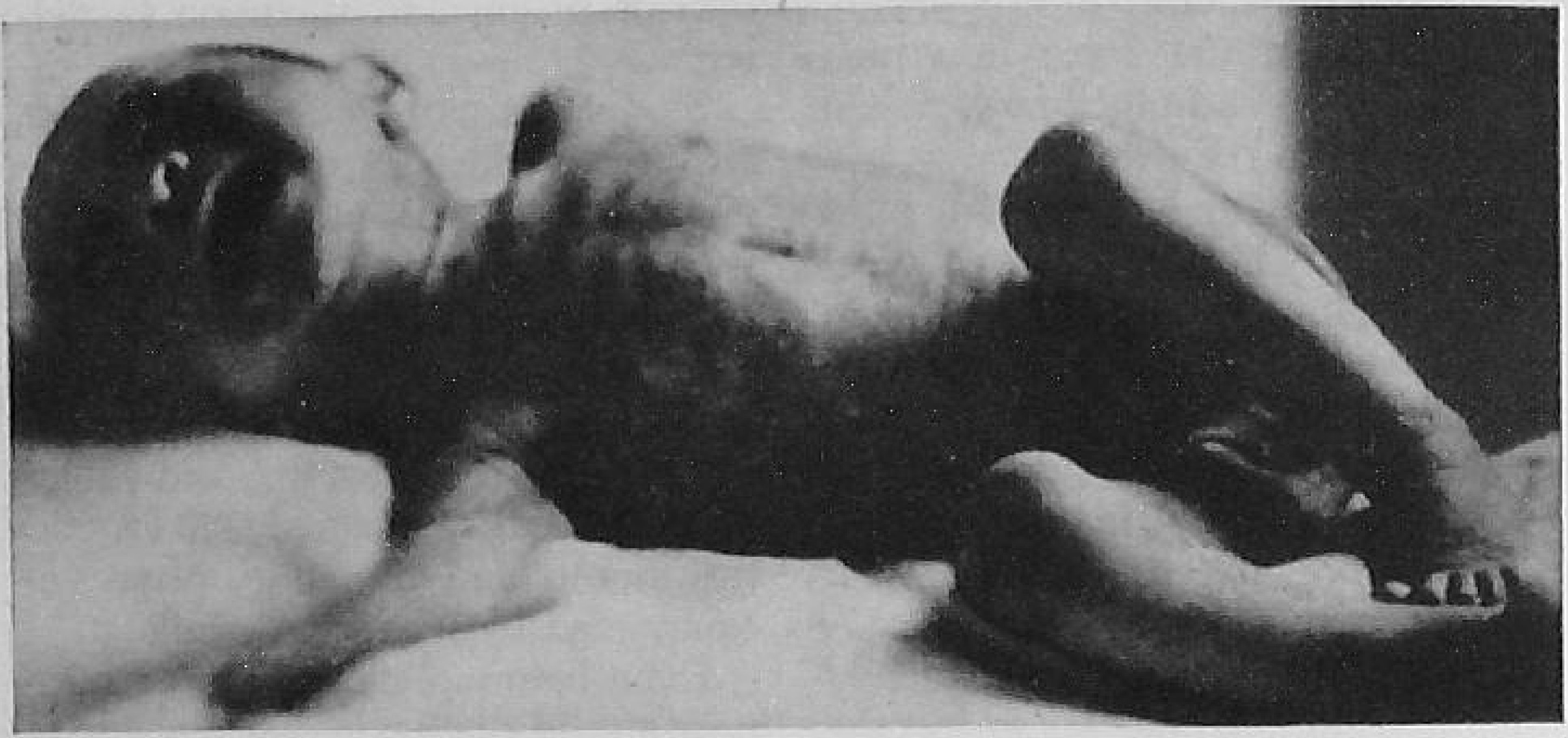


FIG. 58. Infantile scurvy. Typical contractions of extremities from pain. (Hoffmann-La Roche, Inc.)

recognized until the twentieth century, its prevention by the use of fresh foods was practiced much earlier. Prevalent in Europe during the nineteenth century and earlier, for centuries scurvy was attributed to a limited food supply. On the long voyages which followed the discovery of America, sailors often were obliged to subsist for long periods on salt fish and meats, hardtack or other breadstuffs, entirely deprived of any fresh food. The outbreaks of scurvy on such voyages were frequently so severe that there was scarcely enough of the crew left to man the vessel. In 1772, however, Captain Cook took a voyage which lasted three years, during which time not one man was lost because of scurvy. This fact he attributed to the use of a "sweet wort" made from barley and sauerkraut. Subsequently, limes or lemons were included in the supplies, since they had been found to be antiscorbutic, i.e., scurvy preventives.

Scurvy was responsible for most of the deaths among the pilgrims in the Massachusetts Bay Colony during that first hard winter. There was an outbreak of mild scurvy in northern Maine during the depression years, the early 1930's. Other outbreaks of the disease have been associated with famine or war areas, when the food supply was limited. Its occurrence in recent years has been limited chiefly to polar expeditions or other circumstances where fresh-food supplies were unavailable. Expert dietetic advice was sought in planning the food supplies for the more recent polar expeditions in order to avoid the possibility of a vitamin C shortage, because scurvy is greatly dreaded by explorers.

Eskimos seldom have scurvy on their native diets but are susceptible to it when they adopt the "white man's diet." It is possible that their vitamin C intake may be greater or their requirement less on their native diet.

PLATE 1

Manifestations of ascorbic acid deficiency, petechial hemorrhages and bruising are the result of increased capillary fragility. ("Therapeutic Notes," Parke, Davis & Co.)

5.

Scurvy is rare in the United States today, but milder manifestations of ascorbic acid deficiency do occur. It is difficult to estimate these early signs, such as those described in the paragraph on symptoms; thus there are no figures as to the prevalence of so-called latent scurvy.

Etiology. Clinical observations of scurvy in man and the experimental production of a similar disease in guinea pigs and in monkeys have definitely established that scurvy is a deficiency disease due to lack of ascorbic acid. When deprived of this vitamin, well-marked scurvy appears in about 2 weeks in guinea pigs and in about 4 months in man. This may account for the apparent seasonal variation when the disease manifests itself in the spring after a winter in which fresh foods were not available. There is probably a wide gap between the amount of ascorbic acid necessary to prevent scurvy and the amount essential for optimum health.

Symptoms and Pathology. The principal symptoms of scurvy are restlessness, loss of appetite, soreness to the touch, sore mouth and gums with bleeding and loosening of the teeth, black-and-blue spots on the skin due to hemorrhages, and swelling of the legs with special tenderness about the knee joints. Anemia may occur as a result of the loss of blood.

Well-defined symptoms of this disease are seldom encountered in this country, but sallow skin, muddy complexion, lack of energy, and fleeting pains in limbs and joints, so often noted in adolescence, may be due to a shortage of this vitamin. Scurvy in infants and in children frequently is diagnosed as infantile rheumatism, and the treatment, therefore, is quite ineffective. Irritability, retarded growth and tooth defects may also accompany this dietary deficiency.

Mild manifestations of ascorbic acid deficiency in adults may easily be overlooked or ignored. Tendency to bruise easily, slow healing of minor wounds and pin-point hemorrhages may be indications of tissue depletion of this factor. (See Plate 1.)

Secondary and vague symptoms of ascorbic acid deficiency may accompany the well-defined syndrome of another disease. It is well recognized today that peptic-ulcer patients frequently have this complication because of self-imposed dietary restrictions of fresh fruits and vegetables. Recovery from surgery is hastened by the attention now given to ascorbic acid in preoperative and postoperative diets. High fever seems to create an increased demand for this factor. Although the reason for this increased requirement is still obscure, liberal supplements of ascorbic acid in concentrated form in addition to that in the diet may have significant influence on the rate of convalescence. There is considerable evidence, although it is not clear-cut, that ascorbic acid may increase the phagocytosis of the white blood cells when there is infection.

Treatment. An adequate supply of ascorbic acid is the obvious treatment for all these conditions, but what is an adequate supply? The recommended allowance of 70 to 75 mg. for normal adults is obviously not enough to saturate depleted tissues or to meet increased demands associated with fevers and infections.

It is more than enough to prevent any symptom of scurvy. Ascorbic acid in tablet form often is prescribed in daily doses of from 300 to 500 mg. for a short time during acute stages of disease or after surgery. Simple titration of a urine sample to determine the amount of unused ascorbic acid being discarded may show when large doses of this factor are no longer needed. It is harmless but futile to take more than the body can use.

Food sources of this factor are entirely adequate for the prevention of scorbutic symptoms or milder manifestations. For rich food sources of ascorbic acid and for a discussion of its properties and losses in cooking see Chapter 7. Ascorbic acid in tablet form is stable and relatively inexpensive. It is useful when fresh foods are not available or must be omitted from the diet for any reason. This concentrated form was used extensively during the war to promote wound healing and to act as a food supplement in emergency rations.

RICKETS

Incidence and Etiology. The number and the severity of the cases of rickets have been reduced greatly in recent years, thanks to education and suitable prophylactic measures. Formerly, the relatively high incidence of this disease among all classes of children in northern United States, Canada and northern Europe made it one of the deficiency diseases first to attract special attention. The general use today of adequate antirachitic supplements in infant feeding is chiefly responsible for the reduced incidence in northern climates. It is rare in our Southern states and in tropical countries in general, where children live more out of doors and have more skin exposed to the sun. Children of dark-skinned races living in northern climates are even more susceptible to rickets than those of the white race.

The most common form of rickets is due to a vitamin D deficiency accompanying a disturbance in the calcium-phosphorus ratio. The condition seems to be due to an insufficient amount or poor availability of the phosphorus.

Symptoms and Pathology. Rickets is a disease of infancy and early childhood in which the bones do not calcify properly as they grow. They become pliable, malformed and distorted, the result being such evident deformities as pigeon chest, enlarged wrists and ankles and bowed legs or knock-knees which result when the leg bones are not strong enough to support the child learning to walk. All these symptoms are pointed out in the schematic drawing of a child with rickets (Fig. 59), and several of the symptoms may be detected in the child with rickets pictured in Figure 60. The enlargement or beading of the ribs, frequently called "the rachitic rosary," may be less evident in a plump infant than in an emaciated one, but it is a characteristic accompaniment of other deformities. Profuse sweating and restlessness are early symptoms of rickets in infants. Growth may not be retarded at first, since nature seems to allow the bones to increase in length to keep up with growth in other tissues, but their rigidity is decreased because there has not been a sufficient deposit of the stiffening material. Consequently, we may see an infant on

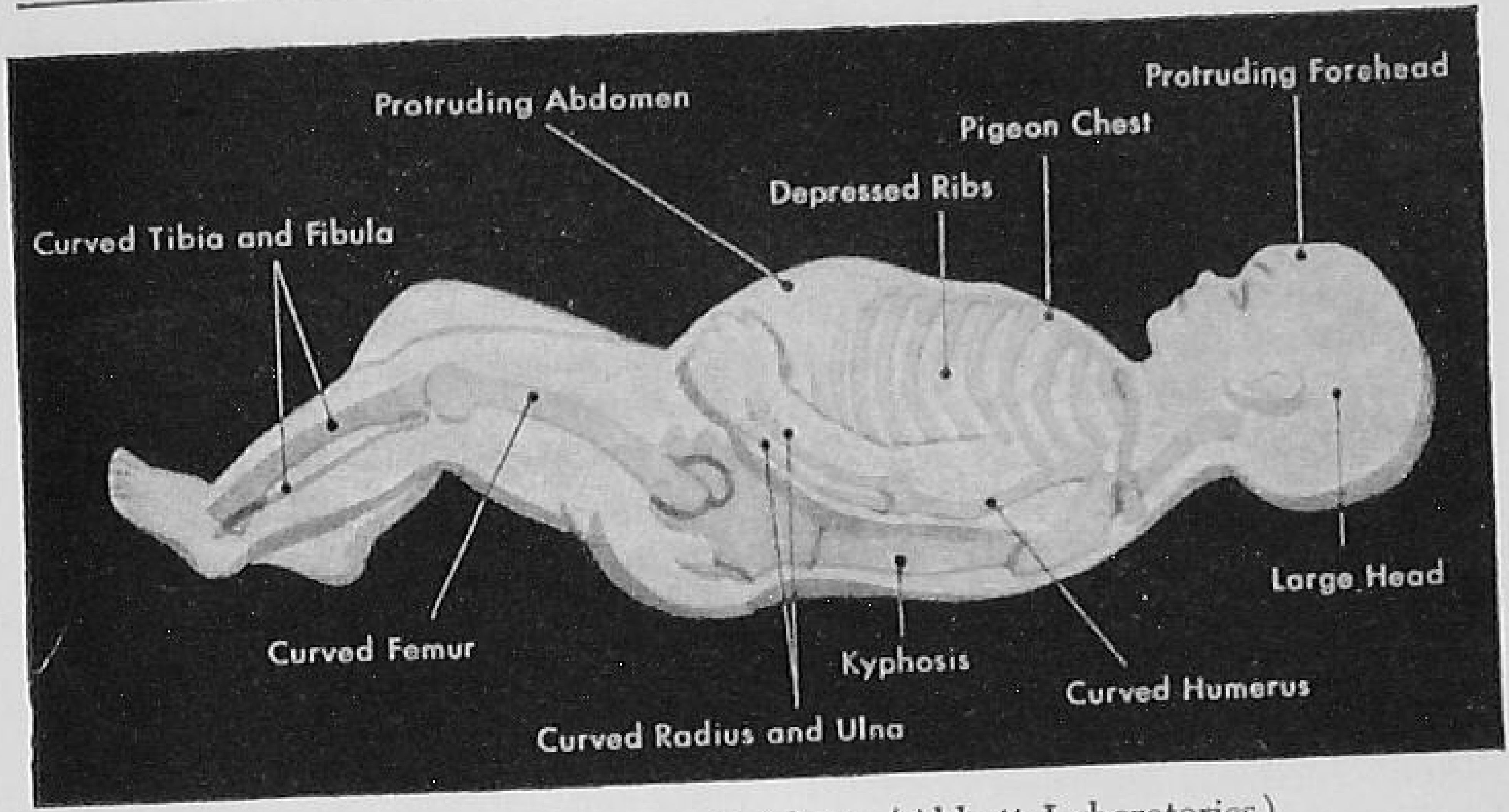


FIG. 59. The symptoms of rickets. (Abbott Laboratories)

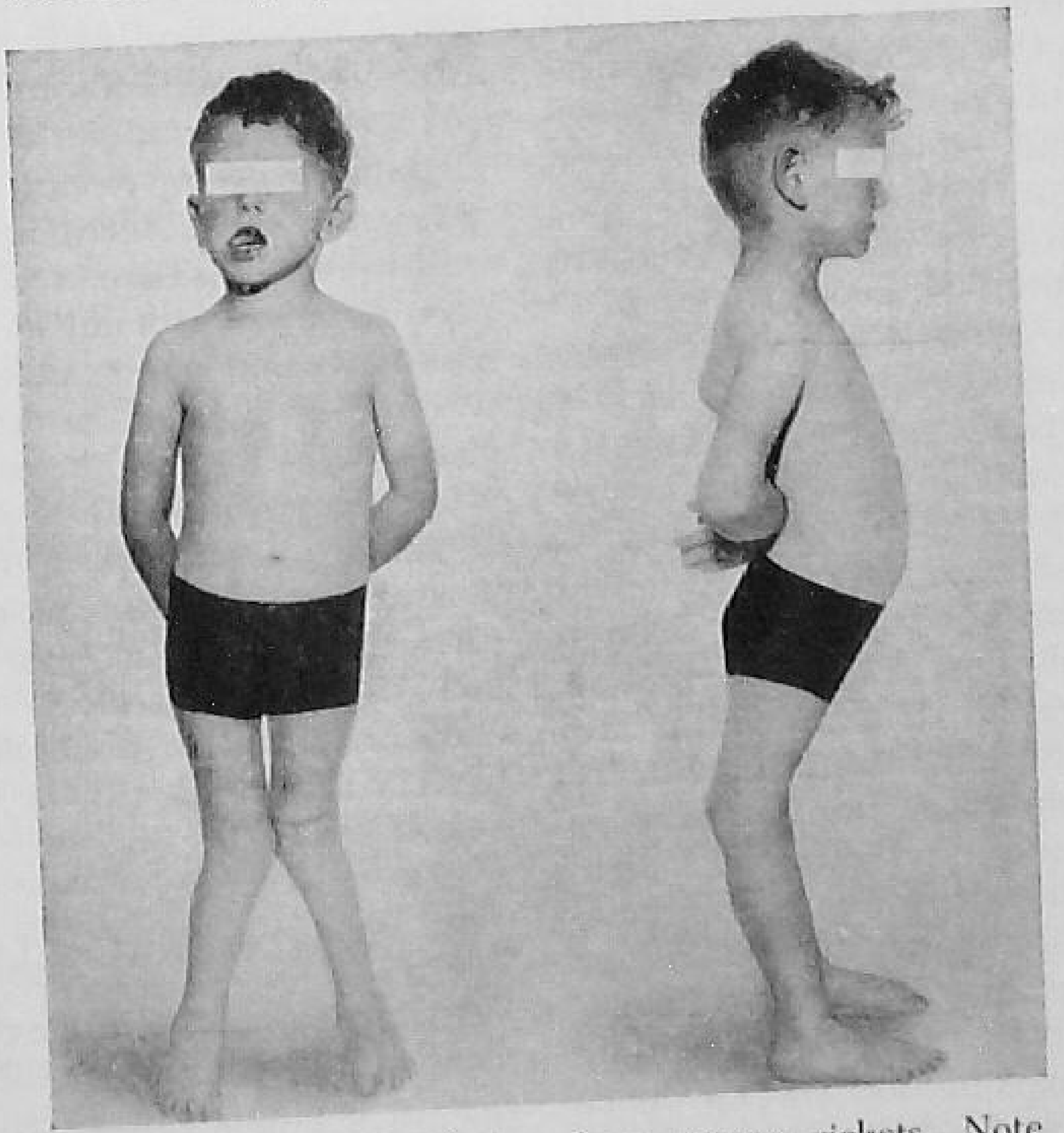


FIG. 60. Child suffering from severe rickets. Note knock knees, flat feet, enlarged joints and other skeletal deformities accompanied by very poor posture. (Wisconsin Alumni Research Foundation)

a high-carbohydrate fattening diet looking plump and well nourished, although a roentgenogram reveals that the bones are not keeping pace with the growth of the body as a whole. When such children begin to walk they show the characteristic signs of rickets. Prolonged and severe cases usually show stunted growth. Since teeth consist of material similar to bone, a diet or other conditions unfavorable for building bone may lead to malformation of the teeth and predispose to dental caries. Infantile tetany may be associated with a low-calcium type of rickets. Tetany is discussed in Chapter 30.

Treatment and Prevention. The major factors involved in the prevention of rickets—calcium, phosphorus and vitamin D—have been discussed in Chapters 6 and 7. The food sources of these minerals and supplementary sources of vitamin D have also been listed there. Since the geographic incidence of rickets and practical experience indicate that it is more often a deficiency of vitamin D which causes rickets in children, attention is directed to the problem of adequate and reliable sources of this factor in regions where sunshine cannot act as the natural preventive agent. Obviously, when children can be exposed to an adequate source of ultraviolet light (sunshine or ultraviolet lamp), sufficient vitamin D may be synthesized to regulate the utilization of minerals for bone building. This fact probably explains the low incidence of rickets in Southern states. However, the routine exposure of children to artificial sources of ultraviolet light is neither feasible nor economical. The food sources of vitamin D are so limited as to make it quite impossible to obtain enough antirachitic potency for curative purposes unless some supplementary source is provided.

Fish-liver oils are now standardized and labeled accurately as to vitamin D potency. Cod-liver oil is less concentrated and less expensive than most of the other more potent fish-liver oils, but the cost per unit of vitamin D should be compared when purchasing. Viosterol, a solution of vitamin D in oil, may be used upon the doctor's advice when a more concentrated source of vitamin D is desirable, but there is no vitamin A in viosterol as there is in the fish-liver-oil preparations.

The present popularity of vitamin D milk as a convenient and a reliable antirachitic agent for infants is well founded. There is a recognized need for extra vitamin D in the diet of infants and young children, even when they are not under a physician's care. Since milk contains the minerals calcium and phosphorus and it is a natural food for children, it seems to be the most suitable carrier for added vitamin D. Fortified evaporated milk is especially convenient for use in vicinities where fresh vitamin D milk is not available. (See Chap. 36.)

OSTEOMALACIA

Incidence and Pathology. Osteomalacia, sometimes called adult rickets, is characterized by poor calcification of bone and resulting deformities. It resembles rickets in certain symptoms but differs in etiology because it is a degenerative change

—a decalcification of bone already formed rather than faulty growth. The disease is most common in women during pregnancy and finds its highest incidence in the Orient among peoples subsisting largely upon cereals. This diet has a low-calcium but high-phosphorus content and is almost devoid of vitamin D. The disease is uncommon among people who have an abundance of food or among the poor who are field workers exposed to sunshine. It occurs among the poorer middle classes who have neither good food nor sunshine.

Treatment and Prevention. Dietary histories of cases of osteomalacia almost always disclose multiple deficiencies. Diet for such persons must be adequate in all respects, special attention being paid to a liberal amount of good-quality protein as well as the bone-building minerals and vitamin D. Milk, milk products, meat, eggs and legumes are both preventive and curative. Fish-liver oil or other concentrates of vitamins A and D usually are prescribed along with a good diet.

DENTAL CARIES

Incidence. Contrary to the endemic or regional incidence of some other deficiencies, dental caries is so common that few readers have not experienced it themselves. It is rare indeed to find adults with absolutely perfect teeth. Figures on incidence of dental caries among population groups vary according to locality, but they are higher than for any other disease discussed in this chapter. Authorities estimate that only 2 per cent of the people in the United States have entirely escaped having at least one dental cavity. The national cost of restoring or correcting dental defects is enormous and a big item in most family budgets.

Etiology. Dental caries has been variously attributed to inheritance, metabolic disturbances, specific or multiple food deficiencies, local conditions in the mouth, including composition of saliva, and lack of fluorine in the water supply. None of these entirely explains the high incidence or varying degree of susceptibility to caries encountered among children of the same family with similar dietary and mouth-hygiene habits.

Prophylaxis. The confusion which still exists concerning the role of diet in dental caries is reflected in the following paragraphs, which give a brief review of several widely accepted theories.

Whether the action is local, systemic, or both, the fact remains that a diet liberal in fruits, vegetables and milk is less likely to promote dental caries than is one high in cakes, cookies and candy. It is especially recommended that some raw fruit or vegetable be eaten at the end of each meal rather than the usual concentrated sweet dessert. The cleansing action on teeth of raw fruits and vegetables is well recognized. The group of investigators who consider that the regular intake of a well-balanced diet is of major importance argue that such a diet maintains high general resistance of body tissues. It is a difficult theory to prove but a practical one to follow until further research indicates the specific factors involved. The important role of calcium and phosphorus in the formation and the growth of sound teeth

is generally accepted, and these same minerals probably help in maintaining healthy teeth, even in adults, according to evidence of research with "tagged" calcium.

Closely related to the preceding is the theory that erupted teeth behave like bone in many respects, and that an abnormal calcium-phosphorus metabolism or a vitamin D deficiency predisposes that individual to dental decay. Such deficiencies during or preceding the eruption of the teeth undoubtedly account for some faults in structure, but whether or not they are a cause of dental caries is an open question. Vitamin A in a well-balanced diet also may be a contributing factor in the formation of normal enamel.

Another group of workers places great emphasis on the regular and liberal intake of vitamin C as part of an otherwise well-balanced diet to prevent deterioration of dentin and pulp, with subsequent increase in susceptibility to decay. Experiments with animals show that a lack of vitamin C affects the gums and predisposes to mouth infection. Loosening of the teeth is a recognized accompaniment of advanced scurvy.

A large group believes that the initial process of tooth decay is brought about by the action of acid on the surface of the teeth. There is evidence that this acid is formed on protected areas of the teeth by the growth of micro-organisms, such as *Lactobacillus acidophilus,* which are capable of fermenting carbohydrate to form lactic acid. Carbohydrate foods of such consistency that particles lodge in the crevices of the teeth furnish a favorable medium for the growth of such acid-producing bacteria. Lowered incidence of caries in children has been observed repeatedly when the intake of artificially sweetened foods was restricted and the use of natural fruits was encouraged; contrariwise, caries has been shown to increase in children when sugars and pastries were added to their diet under controlled conditions (orphanages).

Careful observation and accurate data on large numbers of schoolchildren in northern Europe during and after war-imposed restriction of sugar are significant. These findings indicate a lowered incidence of caries during the years of restriction and a marked increase since sweets have again become available. However, the younger children, whose teeth developed during the period of low sugar intake, show a caries reduction in the postwar period, when sugar consumption is again high. Thus the evidence suggests that the structure of the teeth themselves is important in determining the subsequent caries incidence.

Some authorities suggest that sugar encourages the growth of bacteria in the mouth, particularly in the crevices of the teeth, and that the acid produced by the bacteria may be responsible for the decay. There is evidence that children who do not have cookies or other sticky sweets at the end of the meal tend to have less caries.

Accumulating evidence[8, 9] of the close correlation of the incidence of dental caries and the fluorine content of the drinking water has given impetus to the use of fluorine as a

[8] Dean, H. T.: Am. J. Nursing **52**: 210, 1952.

[9] Review: Nutrition Rev. 9:21, 1951.

PLATE 2

Dental malocclusion following prolonged vitamin D insufficiency in childhood. (Lederle Laboratories and Norman Jolliffe, M.D.)

prophylactic agent. Long-term experiments such as those now in progress in Newburgh and Kingston, N. Y., Grand Rapids, Mich., and others which are well-controlled are most encouraging. It is generally agreed that fluorine is the only known agent ordinarily included in food or water that is capable of exercising mass control of dental caries. However, the control is really effective only during the period of calcification. It may have a slight inhibitory effect in adolescents and adults.

Among the authorities who have studied the problem it is agreed that the simplest, the cheapest and the most far-reaching method of ensuring adequate fluoride is through the fluoridation of the drinking water. A special committee of the National Research Council[10] has concluded: "In view of these considerations, your Committee recommends that any community which includes a child population of sufficient size, and which obtains its water supply from sources which are free from or are extremely low in fluorides, should consider the practicability and economic feasibility of adjusting the concentration to optimal levels. This adjustment should be in accord with climatic factors and a constant chemical control should be maintained. With proper safeguards, this procedure appears to be harmless." The procedure will supplement but not supplant other dental health measures.

The level of fluorine which seems to be protective without being harmful is from 1.0 to 1.5 parts per million (p.p.m.) of drinking water. Mottled enamel (dental fluorosis) is apt to occur when fluorine in the water supply exceeds 2 p.p.m., as it does in certain communities in several western states. However, the absence of caries in people with mottled enamel first called attention to its protective action.

[10] Ad Hoc Committee on Fluoridation of Water Supplies, Maxcy, K. F., Ch. Nat. Research Council, 1951.

HEMORRHAGIC DISEASE OF INFANTS

Incidence and Etiology. One of the hemorrhagic diseases of infants now is prevented largely by the prophylactic use of vitamin K. The deficiency is uncommon in adults, except when something interferes with the absorption of fats and the fat-soluble vitamins which accompany them. A lack of bile flow into the intestine will interfere seriously with vitamin K absorption, and for this reason bile salts often are given when it is necessary to administer vitamin K. The continuous use of mineral oil as a laxative has been known to interfere with vitamin K absorption. In fact, this depletion of vitamin K in the body, due to mineral oil taken during pregnancy, has caused a manifest deficiency in both mother and infant.

Pathology. The slow clotting time of the blood characteristic of this condition is due to too little prothrombin, the clotting agent in the blood. Vitamin K (Koagulationsvitamin) was first shown to hasten the clotting time in chicks and subsequently was tried successfully in similar clinical conditions where slow clotting time was the cause of hemorrhages.

Treatment. The prophylactic use of vitamin K concentrates in the prevention of hemorrhagic disease in infants and also of hemorrhages at parturition is now common practice among physicians. Vitamin K usually is given in tablet form to the mother shortly before delivery, and one dose of 1 or 2 mg. is administered intravenously to the infant very soon after birth. Food sources of this factor are adequate for most people. (See Chap. 7.)

NUTRITIONAL ANEMIA

Anemias may be caused by nutritional deficiencies, metabolic disturbances or loss of blood by hemorrhage. Only the first type may likely be considered a true deficiency; the others might be called conditioned malnutrition. Anemia may occur secondary to general malnutrition and other deficiency diseases (see sprue, pellagra, scurvy and hemorrhagic disease of infants in this chapter). Formerly, nutritional anemia was associated chiefly with iron deficiency, but now it is recognized that possibly protein and vitamins A and C may be involved quite as often. The iron story is discussed more fully in Chapter 6.

Anemia is far more common among females than males and occurs when requirements are greatest and the drain upon stores of iron and other necessary factors is heaviest, i.e., during adolescence, pregnancy and following hemorrhage or wasting disease. Infants of either sex may develop anemia as a result of poor prenatal nutrition or insufficient food supplements during the nursing period. (See Chap. 29, Diseases of the Blood.)

SIMPLE OR ENDEMIC GOITER

Common or simple goiter usually is attributed to an iodine deficiency in food. Since iodine in surface soil shows a very uneven distribution and since plants absorb iodine from the soil, the iodine content of foodstuffs varies with the locality in which they are grown. Thus we find simple goiter most common in those parts of the world where the surface soil is low in iodine. Due to increased facilities for food distribution in the United States today, city people are less confined to food grown in one locality and the incidence of simple goiter seems to be decreasing.

Iodized salt, which is on the market in most goitrous regions, has also proved to be beneficial in reducing the incidence of goiter, as evidenced by examination of school children. In one state in which goiter was almost eliminated, it again became more prevalent when the emphasis on the use of iodized salt was relaxed. If the spectacular decrease in the incidence of goiter which resulted from the use of iodized salt is to continue, more publicity must be given to it, and its use in goitrous sections of the country must be encouraged. (See Chap. 6, Iodine, and Chap. 31, Hypothyroidism.)

EARLY DIAGNOSIS AND TREATMENT OF NUTRITIONAL FAILURE

Mild forms of deficiency diseases which usually are not recognized as clinical entities seldom come to the attention of the general practitioner unless more serious conditions develop, nor has the physician had

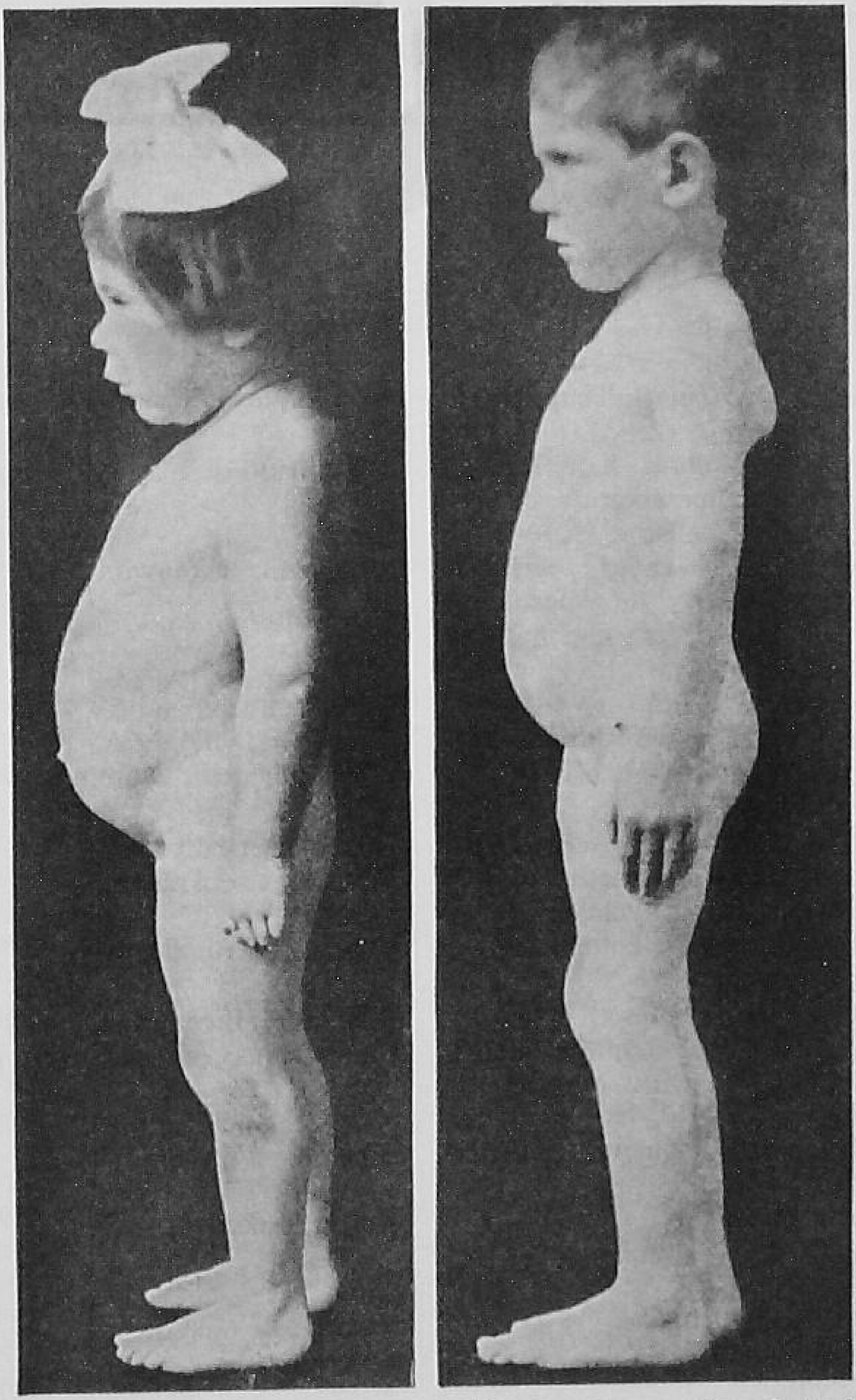


FIG. 61. Iodine deficiency in childhood and corrective effect of thyroid extract. The photographs were taken at the time treatment was begun and one year later. There was an increase of 6 inches in height during this period. (E. C. Kendall, Harvey Lectures, Lippincott)

CLINICAL SIGNS OF NUTRITIONAL FAILURE AND SUGGESTED DEFICIENCY

FINDINGS	SUGGESTED DEFICIENCIES
GENERAL	
Underweight	Calories, protein, Ca, P, vitamins
Underheight (T)	
Pallor (T)	Iron, folic acid, B_{12} ascorbic acid
Lack of appetite (N)	B complex, unknown
SKIN	
Inflammation (perifolliculosis) (N)	Ascorbic acid, vitamin A
Hardening around hair follicles (follicular hyperkeratosis)	Vitamin A
Dermatitis of pellagra (N)	Niacin
Abnormal sebaceous secretion (dyssebacea) in nasolabial folds, behind ears and in body folds (N)	Riboflavin, unknown
Acne vulgaris (T)	Unknown, riboflavin
Hemorrhagic manifestations, petechiae, bruises, etc. (N)	Pyridoxine, vitamin A, ascorbic acid, vitamin K, unknown
EYES	
Bloodshot (corneal vascularity)	Unknown, riboflavin
Inflammation (conjunctivitis) (T)	Vitamin A, unknown
Night blindness (nyctalopia)	Vitamin A
Light sensitivity (photophobia)	Vitamin A, riboflavin
LIPS AND MOUTH	
Cracked lips (cheilosis) (N)	Riboflavin, B complex, pyridoxine
Inflammation of mouth (stomatitis) (N) with cracking at corners	Riboflavin, B complex, iron, niacin
Inflammation of tongue (glossitis) (N)	B complex, protein
Edema of tongue	Niacin, unknown
TEETH	
Caries (N)	Unknown
Malocclusion (T)	Vitamin D, unknown
Scorbutic gums (N)	Ascorbic acid
Gingivitis	Ascorbic acid, unknown
SKELETAL	
Rachitic deformities—"squared" head, beaded ribs, bowed legs, knock knees (N)	Vitamin D, Ca and P
Osteomalacia in adults	Vitamin D, Ca and P

CLINICAL SIGNS OF NUTRITIONAL FAILURE AND SUGGESTED DEFICIENCY
(Continued)

FINDINGS	SUGGESTED DEFICIENCIES
NERVOUS	
Nutritional polyneuritis	Thiamine, B complex
Combined system disease	B complex, vitamin B_{12}
Degenerative brain disease (encephalopathic states)	Thiamine, niacin, B complex, unknown
CIRCULATORY	
Beriberi heart disease	Thiamine
Nutritional edema (T)	Protein, thiamine, famine
ENDOCRINE	
Common goiter	Iodine

Teachers (T) and nurses (N) may be instructed to detect the appearance of these signs.

(Adapted from a more detailed table, Table 13, Jolliffe, *et al.*: Clinical Nutrition, New York, Hoeber, 1950)

any adequate criteria for recognizing these early signs. The insidious development and the delayed clinical evidence of malnutrition make the problem none the less serious. This subject is of great concern to nutritionists, public-health nurses and others who frequently are in closer contact than physicians with children and with families living on low incomes and an inadequate food supply. There is an open field for further study and observation of these deficiency states among all groups of the population, but especially among the lower-income groups, in which the vicious circle of malnutrition, lack of strength and ambition and continued low income offers little opportunity for real improvement.

Several attempts have been made to tabulate the signs and the symptoms associated with specific deficiencies. Jolliffe, Tisdall and Cannon[11] offer helpful descriptions and pictures of deficiency states. As they say:

"Most physicians are familiar with the signs of advanced florid deficiency disease as they occur in classical starvation, protein deficiency, osteomalacia, rickets, scurvy, pellagra and beriberi. Most malnutrition, however, is not this advanced, easily recognized variety but is manifested by signs less fully developed, less severe, or less acute than the classical textbook descriptions imply. These lesser signs are frequently overlooked. Consequently much malnutrition remains unrecognized even when it is sufficiently advanced to cause anatomic changes detectable without the aid of laboratory or other special technics."

The accompanying list adapted from Jolliffe *et al.* suggests that nurses and teachers can help in detecting early signs of malnutrition which should be brought to the attention of the physician.

Recognizing the need for more ex-

[11] Jolliffe, Tisdall and Cannon: Clinical Nutrition, New York, Hoeber, 1950.

Summary of Deficiency Diseases

Name	Deficiency	Symptoms and Pathology	Incidence
Protein deficiencies, edema, hypoproteinemia, Kwashiorkor	Amount of food, protein foods	Edema shifting with posture, pot belly, weakness, lassitude, mental depression	In war and famine areas Africa
Night blindness, glare blindness	Vitamin A, mild deficiency	Poor adaptation to dull light after exposure to bright light. Slow regeneration of visual purple	Adults and children– Low income groups
Xerosis	Vitamin A, mild deficiency	Inflammation and redness of lids, photophobia, itching, burning	Lower-income groups anywhere
Xerophthalmia (conjunctivitis)	Vitamin A, severe deficiency	Drying of cornea, secondary infection, rapid destruction of eye, blindness	Infants more than adults–rare
Beriberi, wet or dry (polyneuritis)	Thiamine, severe deficiency Mild deficiency	Chronic constipation, neuritis, paralysis of lower extremities, with or without edema Muscular and nervous fatigue	In the Orient and Labrador; men more than women
Pellagra	Niacin Thiamine Riboflavin	Symmetric skin lesions Gastro-intestinal disturbances Neurologic symptoms	Southern U.S.A. Southern Europe (corn-eaters)
(No specific term)	Riboflavin	Eyestrain, fatigue and burning; cheilosis, cracks at corner of mouth	Adults or children
Scurvy	Ascorbic acid	Hemorrhages in joints, spongy gums, easy bruising, painful joints	Mariners, explorers and those in famine areas
Rickets	Vitamin D Calcium Phosphorus	Legs bowed or knock-kneed, enlarged wrists and ankles, pigeon chest, pot belly, square head, beaded ribs	Infants and children under 3; northern climates, little sunshine
Osteomalacia, "adult rickets"	Vitamin D (possibly) Calcium (possibly)	Decalcification of bone and resulting deformities	Pregnant women in Orient, low income
Dental caries	Calcium Vitamins C or D (possibly) Fluorine	Cavities in teeth, tendency to decay	Most widespread sign of malnutrition in adults and children
Hemorrhagic disease of infants	Vitamin K	Slow clotting time of blood due to deficiency of prothrombin	Newborn infants
Nutritional anemia, microcytic	Iron, protein, vitamins A and C	Low hemoglobin and red cell count, fatigue, lassitude, paleness and listlessness	Adolescent girls, pregnant women and infants
Common goiter	Iodine	Enlarged thyroid, low metabolism, obesity, dulled mentality in children	Great Lakes states and Northwest; females more than males

perience in judging nutritional status by clinical signs, the National Research Council sponsored a Medical Survey of Nutrition in Newfoundland, where nutritional deficiencies of several types are common. The technics used in such a rapid survey of population groups were reported [12] in detail with colored plates of eye, mouth and skin conditions indicative of deficiencies. A resurvey conducted in 1948,[13] four years after the first one, resulted in pertinent findings, indicating marked improvement as described in Chapter 1. Thus, by the technics used, it was possible after a four-year interval to make comparable observations even when some of the observers had not participated in the first survey.

STUDY QUESTIONS

1. When near-starvation conditions bring multiple deficiencies, which ones are apt to show up first and what should be the emphasis of relief feeding in order to do the most good for the greatest number of people?

2. If you were working in a southern climate and encountered children who had pot bellies and were listless and inactive, would you suspect rickets or some other deficiency, and why?

3. Which deficiencies are more apt to show up in children and which in adults? How will symptoms of the same deficiency vary with age or sex?

4. Is there any evidence that education with a view to better nutrition of children during the past few decades has reduced certain deficiency diseases? If so, which ones?

5. Skin lesions and gastro-intestinal disturbances are symptoms of a deficiency disease which occurs in low-income families in our Southern states. What specific deficiencies and food habits predispose to this condition and what is it called?

6. Families of fishermen in Labrador suffer from chronic constipation and some people become partially paralyzed during the winter months. What deficiency is probably involved, and which members of the family are apt to show the paralysis first?

7. If dental caries was conspicuously less in children of a given community than in surrounding areas, what would you suspect as the protective factor, and why?

8. If an infant is irritable, cries when handled and shows red, inflamed gums, what deficiency would you suspect and how would you supply the missing factor?

9. Mild forms of deficiency diseases undoubtedly occur more often than is known. Why are they not diagnosed earlier? What progress has been made toward earlier recognition of nutritional failure?

[12] Medical Survey of Nutrition in Newfoundland: Canad. M.A.J. **52**:227, 1945.

[13] Medical Survey of Nutrition in Newfoundland, 1948: Canad. M.A.J. **60**:329, 1949.

CHAPTER TWENTY-ONE

Diabetes Mellitus

INTRODUCTION
CAUSES OF DIABETES
SYMPTOMS
DIAGNOSTIC TESTS
SPECIFIC GRAVITY OF THE URINE
SUGAR IN THE URINE
KETONE BODIES IN THE URINE
BLOOD-SUGAR TEST
DIETARY TESTS
PHYSIOLOGIC EXPLANATION OF BODY CHANGES
HOW GLUCOSE GETS INTO THE BLOOD AND THE URINE
HOW KETONE BODIES GET INTO THE BLOOD AND THE URINE
DIET THERAPY
DIETARY PRESCRIPTIONS
PLANNING AND CALCULATING THE DIET
INSULIN THERAPY
TYPES OF INSULIN
INSULIN ADMINISTRATION
DIABETIC EMERGENCIES
COMA
INSULIN REACTIONS
SURGERY
DIABETES IN CHILDREN
DIABETES AND PREGNANCY
TEACHING THE PATIENT

INTRODUCTION

Diabetes mellitus is a chronic disease, the history of which goes back many centuries. The word "diabetes" was derived from a Greek word meaning "to siphon; to pass through"; and "mellitus" came from the Latin word for "honey." Thus the copious urination and sugar in the urine, the two most characteristic symptoms, gave the name to the disease.

Diabetes mellitus, or sugar diabetes, is concerned with carbohydrate metabolism in which the whole endocrine system is involved and particularly the pancreas which supplies the body cells with the necessary insulin for metabolizing the carbohydrate glucose. This disturbance results in partial or complete inability of the body to utilize carbohydrate normally. The carbohydrate which is not burned accumulates in the blood stream, a condition known as hyperglycemia, and is excreted later in the urine. Sugar in the urine is known as glycosuria.

It will be remembered that the pancreas plays an important role in the process of digestion. It produces an external secretion known as pancreatic juice and an internal secretion known as insulin. The external secretion aids in the digestion of protein, fat and carbohydrate in the intestine. The internal secretion is the principal factor in the utilization of carbohydrate by the body cells. The insulin is secreted by special cells of the pancreas which are

arranged in clusters known as the islands of Langerhans.

CAUSES OF DIABETES

Predisposing Causes. Exactly what produces diabetes is not definitely known, but there is a strong hereditary tendency. The disease "runs in families." White[1] has shown that when two diabetics marry, all the children of this marriage are almost certain to have diabetes, and if a diabetic marries into a nondiabetic family half of the children are likely to have the disease. It also seems to afflict certain races, particularly the Jewish race, more than others. Contributing causes may be worry, a sedentary life, bad food habits and obesity. Joslin[2] is confident that overeating, resulting in obesity, is one of the chief predisposing causes of this disease. He found upon reviewing a thousand cases that only 10 per cent of them were underweight, and that 75 per cent were above the normal weight zone. He found that persons 21 per cent or more overweight developed the disease 79 times as frequently as those 21 per cent underweight.

Diabetes is primarily a disease of old age, as its greatest incidence is between 50 and 60 years of age. However, it does affect people of all ages, even young children. The younger the patient the more serious is the disease. In elderly people it is usually a mild condition, associated with arteriosclerosis or some other old age phenomenon. The onset of this disease is generally slow and insidious, but it may be sudden.

[1] White, P.: Diabetes in Children, Bull. New York Acad. Med. **10**:347, 1934.

[2] Joslin, Elliott P.: A Diabetic Manual, Philadelphia, Lea, 1948.

SYMPTOMS

The symptoms which disturb the patient and send him to the doctor are:

1. Frequent and copious urination, known medically as polyuria.
2. Extreme thirst, known as polydipsia.
3. Dehydration, due to polyuria.
4. Excessive hunger, known as polyphagia.
5. Loss of strength.
6. Loss of weight.

Upon arrival at the doctor's office a patient with the foregoing symptoms will usually have blood and urine analyses for sugar. In all probability he will be found to show:

7. Sugar in the urine.
8. Increased sugar in the blood.
9. The patient may be sufficiently ill to require emergency treatment if he is in a state of ketosis (or acidosis) or perhaps even coma.

DIAGNOSTIC TESTS

The **laboratory findings** are always the determining factors in the diagnosis of diabetes. The examination of the urine includes tests for:

1. Volume.
2. Specific gravity.
3. Glucose.
4. Ketone bodies.

The normal volume excreted daily varies, of course, with the amount of fluids consumed and the amount lost through evaporation or perspiration. The normal limits, however, lie roughly between 1,200 cc. and 2,000 cc. (1-2 quarts) for a 24-hour period. If sugar is present, the volume usually is increased; the total volume

often exceeds 3,000 cc. in severe cases. Joslin reports a case which excreted more than 7,000 cc. in 24 hours.

Specific Gravity of the Urine

Specific gravity is the weight of a liquid as compared with an equal volume of water, usually 1 cc. of each. The weight of 1 cc. of water is 1 Gm. The weight, or specific gravity, of normal urine averages from 1.008 to 1.030 Gm. per cc. This additional weight depends on the amount of dissolved substances in the urine. The solids in solution are chiefly urea and salts; and in diseases of the kidneys, albumin. When the total solids of the blood exceed the normal concentration point, the body excretes a larger volume of urine, which is followed by thirst and increased intake of fluids. When large quantities of sugar are excreted, the weight or specific gravity of the urine may be increased above 1.030. The total volume is also increased.

Sugar in the Urine

Sugar in the urine, except when found in mere traces, is strongly indicative of diabetes mellitus, although there are a few exceptions. These include renal glycosuria, when the renal threshold for glucose is lowered; alimentary glycosuria, when too much sugar has been ingested at one time for the liver to store the excess; pentosuria, when the body fails to oxidize a certain carbohydrate called pentose; fructosuria, when fructose is not utilized, and lactosuria in nursing mothers, when lactose is produced in excess quantity. For more specific details concerning the tests when diabetes mellitus is suspected, see Special Tests, Part Four.

Ketone Bodies in the Urine

Certain substances may appear in the urine as the result of incomplete burning of the fats. The presence of these substances, known as ketone bodies, is indicative of a serious condition called ketosis, or diabetic acidosis, which, if not corrected, may result in coma.

Blood-Sugar Test

Although the presence of glucose in the urine is strongly suggestive of diabetes mellitus, a blood-sugar examination is necessary to make the diagnosis certain. This test is made after a 12-hour fast; in diabetes it will show a much higher level of blood sugar than the normal level of 70-100 mg. per 100 cc. of blood. When this test is not conclusive, a glucose tolerance test on the blood should be made. The latter test is carried out by giving a known amount of glucose in proportion to the body weight after a 12-hour fast. The blood sugar is examined before the glucose is given and again in ½ hour, 1 hour and 2 hours after the glucose is taken. In some conditions it is necessary to continue this test at hourly intervals for as much as 6 hours. Note the difference in the glucose tolerance curve between a normal person and a diabetic (Fig. 62).

Dietary Tests

Testing the Carbohydrate Tolerance

The capacity for burning glucose is known as the patient's carbohydrate tolerance. It is the difference between the glucose equivalent of

the diet and the glucose excreted in the urine. To determine this in a patient without ketosis, a calculated weighed diet of known composition, usually low in both carbohydrate and calories, is given, following which analyses are made for several days. If the urine is sugar-free, it is an indication that the patient may be able to burn more carbohydrate, and another diet with increased carbohydrate and calories is tried. This diet is continued or increased cautiously unless sugar again appears, when it is evident that the patient's tolerance has been exceeded, and in all probability his standard diet will be based on the carbohydrate value of the diet used prior to the appearance of urinary sugar. This amount, if much below normal, probably will be increased somewhat by the use of insulin, as described later in this chapter.

PHYSIOLOGIC EXPLANATION OF BODY CHANGES

How Glucose Gets into the Blood and the Urine

Glucose and Glycogen. Carbohydrates such as starch, cane sugar (sucrose) and milk sugar (lactose) enter the body as food. After being

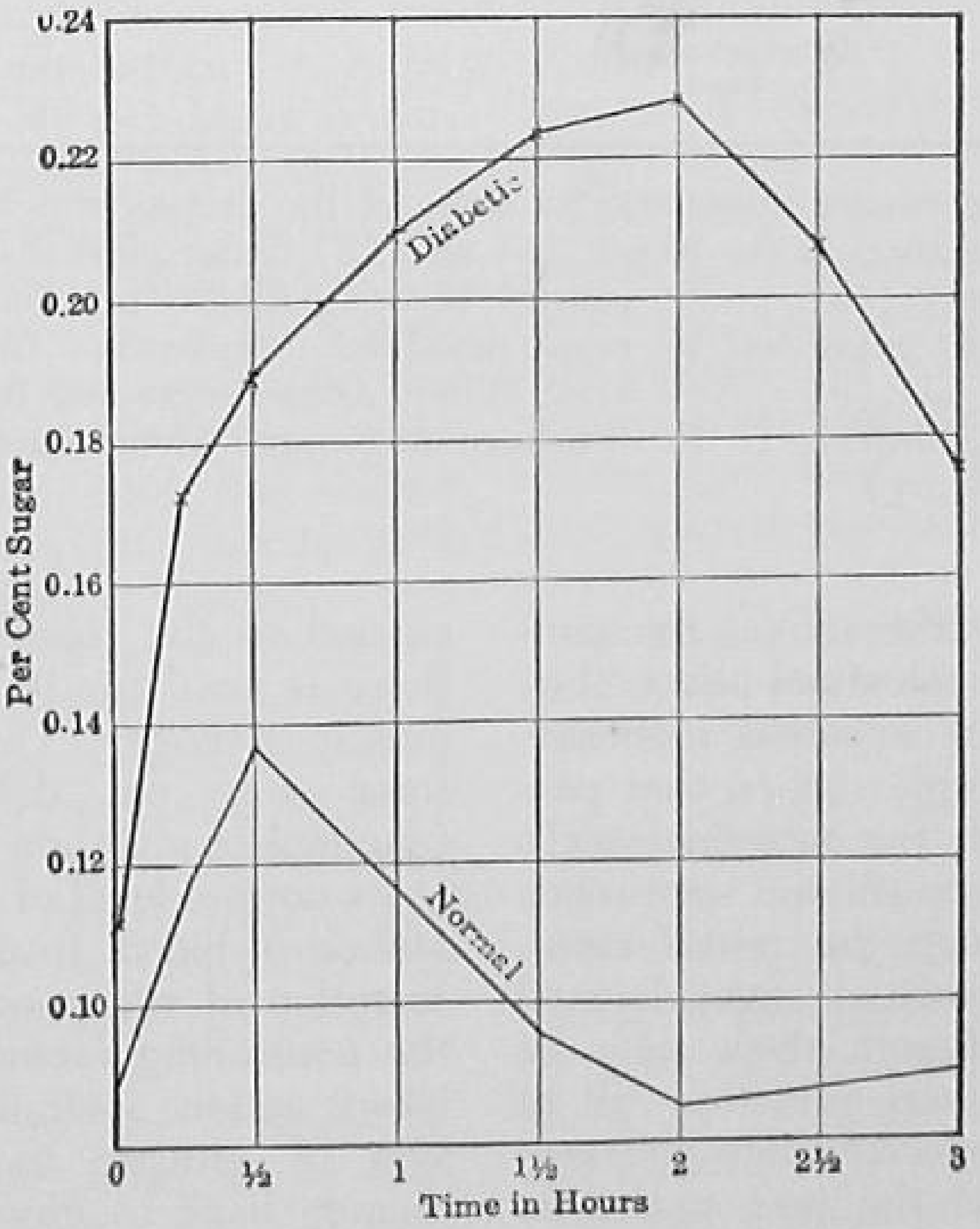


Fig. 62. Glucose tolerance curve in the case of a normal and a diabetic individual. Ordinates = per cent sugar, abscissas = time after the ingestion of 100 Gm. of glucose. (Bodansky: Introduction to Physiological Chemistry, New York, Wiley)

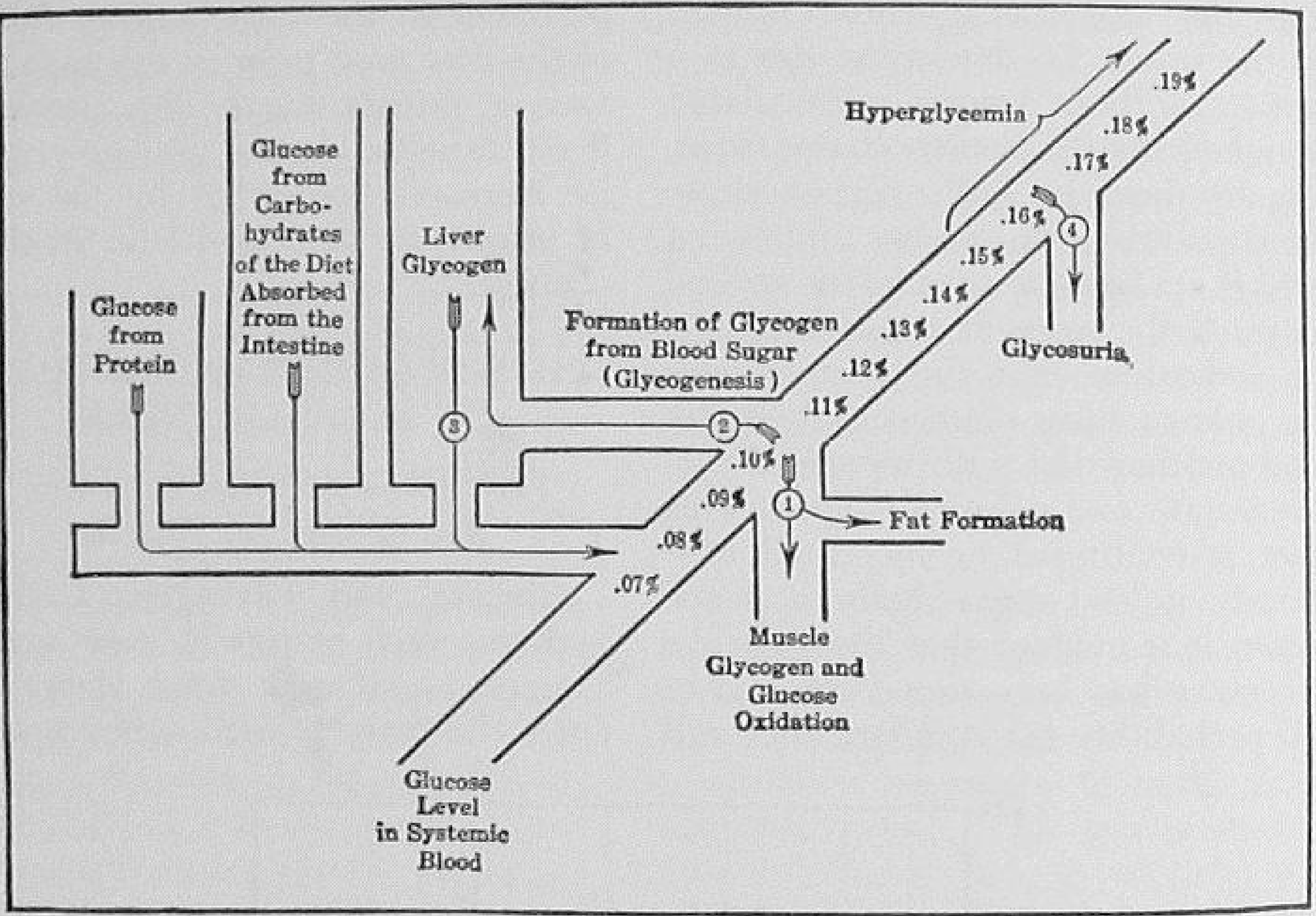


FIG. 63. Schematic illustration of some of the factors which regulate the sugar concentration of the blood. (1) and (2) under control of insulin and other hormones; (3) under control of sympathetic nervous system and Adrenalin; (4) regulated by renal threshold. (Bodansky: Introduction to Physiological Chemistry, New York, Wiley. After Ringer and Baumann, with modifications. Barker, L. F.: Endocrinology and Metabolism, New York, Appleton-Century)

acted upon by the saliva, the pancreatic and the intestinal juices, they are changed to so-called monosaccharides, or simple sugars, that pass readily through the intestinal walls into the blood stream and soon reach the liver through the portal circulation. The principal sugar formed is glucose, although there may be some fructose and galactose, all of which are transformed into glycogen when they reach the liver, as already stated in Chapter 2. The liver then allows a portion of this glycogen, reconverted to glucose, to pass into the blood stream to maintain the normal blood-sugar level and to be carried to the tissues as rapidly as there is need for it to be stored as muscle glycogen. Thus the liver, in some way not definitely known, functions to maintain the blood sugar at its normal level of 70-100 mg. per 100 cc. of blood. Insulin, the internal secretion of the pancreas, is one of the controlling factors in this regulatory action, including the conversion of glucose to glycogen, the change back to glucose and its release to the tissues, and its utilization by the tissues.

Insulin Deficiency. When disease interferes with regular production of insulin this control of the blood-

sugar level is lost, and the glucose remains in the blood stream instead of being stored as glycogen in the liver or in the muscles. Consequently, the blood sugar rises, but, since it is excess material, some means for disposing of it must be found. When it reaches the level of 160 to 180 mg. per 100 cc. of blood, known as the renal threshold, glucose is excreted by the kidneys and appears in the urine. The tissues also become flooded with glucose and, consequently, may fail to function normally.

Mechanisms of Carbohydrate Metabolism. The mechanisms by which the body attempts to control the carbohydrate metabolism may be likened to a great mountain stream controlled by dams and reservoirs. The first dam is probably the insulin, which, through its control, causes the reservoir, the liver, to be filled with glycogen. When, for any reason, this reservoir is broken down, the stream below is flooded, and the second dam, the kidneys, attempts to hold it in check. When it reaches a certain level there, it again overflows and in all probability will spread to the fields beyond, which, according to the simile, represent the tissues of the body. As the fields require moisture, so do the tissues require glucose, but an overabundance or flooding in either case may be detrimental.

The kidneys are also the sluiceway which eventually allows for an overflow into the urine when the flood level of sugar reaches the critical level. The original source of the sugar as it appears in both the blood and the urine is, as stated, the food supply. Of course, it comes chiefly from the carbohydrates—starch and the various sugars; but it is interesting to know that each of the other food constituents—protein and fat—contributes to this supply also. When the proteins are digested and converted into amino acids, they too find their way to the liver, where they are allowed to pass through to the tissues if needed for repair or growth. If not in demand for immediate use, they are deaminized, as stated in Chapter 4. The nitrogenous portion is eliminated, while the glucose portion of the remainder is stored like any other carbohydrate. While there is some difference in the various kinds of protein as to the percentage of glucose which each yields, the average is 58 per cent of the total weight of protein.

Likewise, when the fats are digested, fatty acids and glycerol are produced. The glycerol is converted into glucose and stored by the liver, as carbohydrates from any other source are used. Theoretically at least, all fats yield about 10 per cent glucose.

There are, therefore, three sources of glucose from which blood sugar may be derived:

	Per Cent
Carbohydrates	100
Protein	58
Fats	10

The total glucose in a day's diet may be expressed by the following formula: $G = 100\% \ C + 58\% \ P + 10\% \ F$.

During fasting or starvation or an insufficient food supply, the body protein and fat serve as sources of carbohydrate, though in insufficient amounts to constitute a normal supply.

How Ketone Bodies Get into the Blood and the Urine

Fats, after digestion, find their way into the blood largely via the lymphatic system (see Chap. 8). In the process of oxidation in the cell, ketones are formed, which are then further oxidized to carbon dioxide and water. In untreated diabetes, when the patient is not metabolizing glucose and must depend on increased fat oxidation for his energy, ketones tend to pile up because they are produced in much greater quantity. They enter the blood stream and, because two of the three ketones are acids, upset the acid-base balance, hence the name acidosis or ketosis. They are excreted in the urine with the excess sugar. One of them, acetone, is volatile. It may escape from the blood in the lungs and appear on the breath, giving a typical "ripe pear" odor.

DIET THERAPY

General Discussion. As can be seen from the foregoing paragraphs, the treatment of diabetes is by diet and, if necessary, insulin. However, today there is a sharp difference of opinion over the degree of dietary restriction. The controversy is over the effect of blood-sugar levels on the eventual health of the patient. Diabetics are more susceptible than others to the pathologic changes in the blood vessels known as arteriosclerosis. Not only does this occur more frequently in diabetics than in nondiabetics, but it occurs in younger age groups. There is little question that in general the duration of the diabetes is the most significant factor in the onset of blood-vessel changes although it must be noted that some diabetics have marked damage soon after the onset of diabetes, while Joslin[3] cites 23 diabetics who have had the disease for 25 years or more without any demonstrable blood-vessel change.

Chemical Method of Regulation. The conservative group of physicians[4] believes that blood-sugar levels higher than normal, resulting in the presence of sugar in the urine, contribute to the onset and the severity of arteriosclerotic changes in diabetes. Hence the diet is regulated very carefully so that with the insulin prescribed all the food will be metabolized, the blood sugar levels will be kept within normal limits and no sugar will be spilled into the urine. This is known as the chemical method of regulation of diabetes.

Clinical Control of Diabetes. However, dietary restrictions are difficult to maintain indefinitely, and patients again and again "break their diet." With our increased understanding of the role of food to satisfy emotional as well as physiologic needs, some physicians have come to re-assess the need for very carefully restricted diets and have allowed their patients a so-called "free" diet. This regimen permits the patient to eat what he wishes as long as he has no symptoms of diabetes other than glycosuria—spills no ketone bodies in the urine and maintains his weight (or gains or loses weight as necessary). The larger part of the diet is assured of metabolism by a prescribed dose of insulin. The patient

[3] Joslin, E. P.: J.A.M.A. **147**:209, 1951; Keiding, N. R., *et al.*: J.A.M.A. **150**:964, 1952; Rickets, H. T.: J.A.M.A. **150**:959, 1952.

[4] *Ibid.*

is allowed to spill excess sugar into the urine if he has eaten more carbohydrate than he can use. These physicians[5] claim that there is no indication that such patients have more extensive arteriosclerotic changes than those kept under a strictly controlled diet, and that the less restricted diet enables the patient to live more nearly a normal life. This method is called the clinical regulation of diabetes.

Moderate Method of Dietary Control. In between these two schools of thought are those[6] who are of the opinion that a liberal but not a "free" diet, with moderate control of the blood-sugar levels and glycosuria is the most desirable method of treating both the disease and the patient. Mosenthal[7] believes that it may be of advantage to assess the personality of the patient, and suit the diet more nearly to his ability to follow it. Thus a new diabetic may do best on a carefully controlled diet until he feels secure with his disease, after which the dietary restrictions may be somewhat relaxed.

Dietary Prescriptions

The dietary prescription takes into consideration (1) the severity of the disease and (2) the maintenance requirements of the patient.

The severity of the disease has already been discussed in connection with the glucose tolerance and other tests. Mild cases without ketosis may be controlled by diet alone, while the more severe cases require insulin treatment as well.

The maintenance requirements for calories are the same as for normal individuals of the same sex, height, build and activity. Many normal people, however, consume a larger quantity of food than is actually required for the maintenance of health and bodily activity. The diabetic is cautioned not to exceed the actual requirements. Indeed, it is usually thought best for him to maintain himself at slightly below the average weight (see Table 13, Part Four). The energy requirements have been discussed in Chapter 5. Exercise is considered of therapeutic value because it lowers the blood sugar and therefore lessens the amount of insulin needed.

The energy requirement for a man of average size doing sedentary work is from 2,000 to 2,400 calories, while a woman will require from 1,800 to 2,000 calories. The usual prescription for diabetics calls for 30 calories per kilogram (2.2 lbs.) of normal body weight. It will be remembered that for an adult the daily requirement is from 60 to 70 Gm. of protein, but many physicians now prescribe as high as 100 Gm. because less glucose results from the metabolism of protein than from carbohydrates and it has a higher satiety value.

The requirements for energy and protein are quite definitely established, but there is some difference of opinion among physicians as to the optimum ratio of carbohydrate to fat in the diet. Two grams of carbohydrate to one of protein and one of fat are frequently prescribed. In the preinsulin days the amount

[5] Dolger, H.: J.A.M.A. 134:1289, 1947; Tolstoi, E.: Am. J. Nursing **50**: 652, 1950.

[6] Mosenthal, H. O.: Ann. Int. Med. 29:79, 1948.

[7] *Ibid.*

of carbohydrate given was necessarily much lower than it is today, and what was then described as a high carbohydrate ratio would be called low carbohydrate today.

At the present time one school of thought advocates what some physicians call a "high carbohydrate" and others a "normal carbohydrate" diet, depending upon the point of view. Compared with the usual practice in handling diabetic patients, it is high carbohydrate, but when compared with the diets of normal people it at least approaches normal carbohydrate.

Joslin[8] probably expresses the consensus at the present time in the following statement:

"The proportion of carbohydrate, protein and fat is an individual study and differs from the normal diet in that the carbohydrate content is usually lower with a corresponding increase in fat to supply the caloric allowance."

The distribution of the carbohydrate in the day's diet is quite as important as the total quantity consumed. For patients who do not require insulin, the total carbohydrate is divided equally for the three meals. Since the blood sugar is usually at its height during the morning hours, some doctors advise a lower carbohydrate at breakfast, about ⅕ of the day's allowance, with ⅖ at noon and ⅖ at night, even for patients not requiring insulin.

If the patient is using regular insulin, the distribution of the carbohydrate will depend on how many doses of insulin are ordered during the day. If three doses are to be given, one before each meal, the carbohydrate usually is divided into thirds. If a dose is to be given before breakfast and one before supper, the carbohydrate division will more likely be ⅖, ⅕ and ⅖.

Protamine zinc insulin is used most commonly because only one dose per day is necessary. This is a slow-acting insulin, and the carbohydrate usually is given ⅕ at breakfast and ⅖ each at lunch and supper, after an evening feeding of milk and crackers has been deducted from the total carbohydrate allotment for the day. The evening feeding is necessary to prevent insulin shock during the night or the early morning, when the protamine zinc insulin may still be functioning and the carbohydrate of the supper meal has been metabolized.

When NPH insulin, a modification of protamine insulin, is used the carbohydrate in the diet may be divided into thirds, or it may be given ⅕ at breakfast and ⅖ at lunch and dinner. In either case an evening feeding is required.

Globin insulin, also slow-acting, may require 4 meals a day, dividing the carbohydrate ⅙ each for breakfast and midafternoon and 2/6 each for lunch and dinner. If only three meals are ordered, using this type of insulin, the carbohydrate may be distributed so as to allow ⅙ for breakfast, 3/6 for lunch and 2/6 for supper.

General Principles for All Diabetic Diets. Although there may be some differences of opinion as to the principles just outlined, there is general agreement that the following are important factors in the dietary treatment of diabetes mellitus:

1. The caloric intake should allow

[8] Joslin, Elliott P.: Diabetes Mellitus *in* Pattee's Dietetics, New York, Putnam, 1945.

the patient to lose or gain weight as necessary until he reaches his average or slightly below average level for his sex, height and build; after which it should be such as to maintain this weight.

2. Protein should be normal, 1 to 1½ Gm. per kilogram of body weight.

3. Carbohydrates are somewhat restricted.

4. Fats are used to make up the "balance" of the total calories required. Fat never must be in sufficient quantity to produce ketosis.

5. The diet must be adequate in all essential nutrients.

The restrictions of this diet are more in relation to the quantities allowed than with regard to the variety.

Planning and Calculating the Diet

Chemically Controlled Diabetes. The patient must be made to realize that his health and usefulness to society depend upon his strict attention to his diet, although for psychological reasons he must not be made to feel that he is different and that he does not share in the family life. His meals must be built around

Diabetic Diet

Foods Allowed:

Milk	Fresh, dried or canned (unsweetened); buttermilk, skim milk.
Cheese	All.
Fats	All.
Eggs	All.
Meats, fish and fowl	All.
Soups	Broths and clear soups.
Bread, cereals, Italian pastes	All.
Vegetables	All, fresh, canned or frozen, including potatoes; cooked or as salad.
Fruits	All fresh or canned without sugar.
Desserts	Fruits as above; custards and gelatins made without sugar. (Saccharine or succaryl may be used for sweetening.)
Beverages	Tea, coffee, milk, cocoa (unsweetened or with saccharine or succaryl), fruit juice (unsweetened).
Condiments	Salt, pepper, vinegar, spices.

Foods to Be Avoided or Used Sparingly:

Sugar	All forms, including candy, chewing gum, honey, syrups and molasses, jellies, jams and preserves, fruit canned with sugar.
Fruits	Dried fruits.
Desserts	All pastries, cakes and sweetened desserts.
Legumes	Peas, beans, lentils; they may be used if calculated on the basis of both the protein and the carbohydrate content.
Beverages	Soft drinks and alcoholic beverages.

Note: Also all foods of unknown composition.

Sample Diabetic Diet[1]

Prescription: Protein, 90 Gm.; Fat, 100 Gm.; Carbohydrate, 200 Gm.

Meals	Food Items	Amount Allowed	Protein	Fat	Carbohydrate	Calories
Breakfast:		Gm.	Gm.	Gm.	Gm.	
	Cantaloupe[2]	One half ... 200	2	...	10	40
	Egg	One ... 50	6	6	...	77
	Toast	1 slice ... 23	2	1	12	63
	Butter or margarine[3]	1 teaspoon ... 5	..	4	...	33
	Milk	1 cup ... 244	9	10	12	166
	Coffee	...	..	...	...	..
	Light cream	2 tablespoons ... 30	..	6	2	60
			19	27	36	439
Dinner:	Tomato juice	1 glass ... 200	2	...	8	42
	Roast beef	3 medium slices .. 75	18	18	...	239
	Carrots[2]	1 serving ... 100	1	...	9	42
	Potato	1 medium ... 100	2	...	19	83
	Bread	2 slices ... 46	4	2	24	126
	Butter or margarine[3]	2 teaspoons ... 10	..	7	...	66
	Grapefruit[2]	One half ... 100	1	...	10	40
	Coffee or tea	...	..	...	...	..
	Light cream	2 tablespoons ... 30	..	6	2	60
			28	33	72	698
Supper:	Broth	...	..	...	...	..
	Roast chicken	2 large slices ... 60	12	8	...	120
	Peas[2]	1 serving ... 100	5	...	12	70
	Summer squash[2]	1 serving ... 100	1	...	4	16
	Lettuce and tomato[2]	1 serving ... 100	1	...	4	20
	French dressing	½ tablespoon ... 8	..	3	1	31
	Bread	2 slices ... 46	4	2	24	126
	Butter or margarine[3]	2 teaspoons ... 10	..	7	...	66
	Milk	1 cup ... 244	9	10	12	166
	Cherries, whole[2]	1 cup ... 100	1	1	15	61
			33	31	72	676
Bedtime Feeding:	Milk	1 cup ... 244	9	10	12	166
	Crackers	2 small ... 10	1	1	7	40
			10	11	19	206
		Day's Totals ...	90	102	199	2,019

[1] Figures from Table 1, Part Four.
[2] Other fruit and vegetables of the same composition may be substituted.
[3] Butter or margarine may be used in cooking as well as a spread. Total for the day should not exceed the amount included in the three meals.

the essentials, as described in the basic dietary pattern (see Chap. 17), and it should be planned as far as possible around the family menus, or perhaps better still, the family's meals around the patient's diet.

The doctor's prescription is given in terms of the number of grams of protein, fat and carbohydrate. This necessitates the careful calculation in terms of foods allowed and the weighing of the diet, at least at the beginning. For example, the prescription might be as follows:

Protein	90 Gm.
Fat	100 Gm.
Carbohydrate	200 Gm.

To calculate such a diet, the quantities of the basic seven foods needed for adequate nutrition are listed and their food composition recorded. Additional foods are then added until the total composition meets the doctor's prescription. The foods are then planned into four meals as shown on page 300, care being taken to distribute the carbohydrate in accordance with the type of insulin prescribed.

Tables of Food Values must be consulted carefully. Table 1 in Part Four gives detailed information of food composition. Tables 4 and 5 in Part Four, classifying fruits and vegetables according to carbohydrate content, also will be found useful.

Variations in Food Composition. It always must be remembered that all tables of food values are based upon average composition, and that there may be considerable variation. The Bureau of Home Economics, U. S. Department of Agriculture,[9] has undoubtedly given us the most accurate classification of foods we have. However, for easy use, vegetables and fruits are sometimes grouped according to their carbohydrate content. This has been done at 3-Gm. carbohydrate intervals. Others prefer to use 5-Gm. carbohydrate intervals as being easier for the patient to use. Still others allow the patient to eat freely of all 3 per cent vegetables and do not begin to count the carbohydrate until the 6 per cent grouping.

There is probably more variation in cuts of meat than in vegetables. Fat is the factor of variance. In order to prevent any gross error, only lean meats should be served unless the fat value is quite stable, as in bacon. The shrinkage of meats, owing to cooking, introduces another variable; hence, in using tables of food values, care should be taken to note whether they are based upon raw or cooked weight.

Cereals in all weighed diets should be calculated upon the dry weight. If based upon cooked weight, errors may be introduced because of difference in proportion of water used and in the evaporation. It is well to prepare individual portions of cooked cereals, although care must be taken to use a double boiler or in some way prevent loss of material adhering to the container. A typical diabetic diet is shown on the previous page.

A more liberal yet moderately accurate method for choosing a diabetic diet was prepared in 1950 by the American Dietetic Association and approved by the American Diabetes Association and the United States Public Health Service. The result is the booklet Meal Planning

[9] Watt, B. K., and Merrill, A. L.: U.S.D.A., Agriculture Handbook No. 8, 1950.

with Exchange Lists.[10] In it, foods having a more or less common composition are grouped together in such quantities that one food can be exchanged for another in each group. The patient is allowed to choose the permitted number of servings in each group according to his preference. The exchange lists are reproduced on pages 302-305, and recipes based on exchanges will be found in Chapter 50. The original booklet contains a good deal of additional explanatory material.

A series of six meal plans[11] are also available ranging from 1,200 to 2,600 calories, and of varying carbohydrate, protein and fat content. These are intended for use by the physician in prescribing for a particular patient. An example of one of these, Meal Plan No. 4, contains 90 Gm. protein, 100 Gm. fat, 220 Gm. carbohydrate and 2,200 calories. The food allowance and the meal plan for the day plus two suggested menus are reproduced on pages 306 and 307.

Free or Nonrestricted Diabetic Diets. As has already been stated there is a school of diabetic specialists today who believe that no harm is done if the patient spills sugar so long as he maintains his normal weight and shows no ketone bodies in the urine. Accordingly, the patient is allowed to eat an ordinary diet, including all the foods such as sugar, desserts and other carbohydrate-rich foods ordinarily not included in a diabetic regimen. Other physicians limit these foodstuffs to some extent, but do not require the patient to follow a strict regimen. Insulin is given once a day. These physicians

(*Continued on p.* 305)

[10] Obtainable from the Health Publications Institute, Inc., Raleigh, N. C. Price: 10 cents.

[11] Meal Plans 1 to 6, Health Publications Institute, Inc., Raleigh, N. C. Price: 30 cents.

Meal Planning with Exchange Lists for the Diabetic*

List 1. Milk Exchanges. One exchange of milk contains 8 Gm. protein, 10 Gm. fat, 12 Gm. carbohydrate and 170 calories

This list shows the different types of milk to use for one exchange:

Type of Milk	Amount to Use	Type of Milk	Amount to Use
Whole milk (plain or homogenized)	1 cup	† Powdered skim milk (nonfat dried milk)	¼ cup
† Skim milk	1 cup	Buttermilk (made from whole milk)	1 cup
Evaporated milk	½ cup	† Buttermilk (made from skim milk)	1 cup
Powdered whole milk	¼ cup		

You can use one type of milk instead of another. For example, you may use ½ cup evaporated milk in place of one cup of whole milk.

* Adapted from Meal Planning with Exchange Lists, Health Publications Institute, Inc., Raleigh, N. C.

† Skim milk and buttermilk have the same food values as whole milk, except that they contain less fat. Add 2 fat exchanges to your meal when you use one cup of skim milk or buttermilk made from skim milk.

List 2. Vegetable Exchanges. Group A contains little protein, carbohydrate or calories. You may use as much as one cup at a time without counting it

Asparagus	°GREENS	Lettuce
°Broccoli	Beet greens	Mushrooms
Brussels sprouts	Chard	Okra
Cabbage	Collard	°Pepper
Cauliflower	Dandelion	Radishes
Celery	Kale	Sauerkraut
°Chicory	Mustard	String beans, young
Cucumbers	Spinach	Summer squash
°Escarole	Turnip greens	°Tomatoes
Eggplant		°Watercress

° These vegetables contain a lot of vitamin A.

List 2. Vegetable Exchanges. Group B. Each exchange contains 2 Gm. protein, 7 Gm. carbohydrate and 35 calories

½ cup of vegetable equals one exchange:

Beets	Peas, green	°Squash, winter
°Carrots	Pumpkin	Turnip
Onions	Rutabagas	

° These vegetables contain a lot of vitamin A.

List 3. Fruit Exchanges. One exchange of fruit contains 10 Gm. carbohydrate and 40 calories

This list shows the different amounts of fruits to use for one fruit exchange:

	AMOUNT TO USE		AMOUNT TO USE
Apple (2″ diam.)	1 small	Grapes	12
Applesauce	½ cup	Grape juice	¼ cup
Apricots, fresh	2 medium	Honeydew melon	⅛ medium
Apricots, dried	4 halves	Mango	½ small
Banana	½ small	°Orange	1 small
Blackberries	1 cup	°Orange juice	½ cup
Raspberries	1 cup	Papaya	⅓ medium
°Strawberries	1 cup	Peach	1 medium
Blueberries	⅔ cup	Pear	1 small
°Cantaloupe (6″ diam.)	¼	Pineapple	½ cup
Cherries	10 large	Pineapple juice	⅓ cup
Dates	2	Plums	2 medium
Figs, fresh	2 large	Prunes, dried	2 medium
Figs, dried	1 small	Raisins	2 tbsp.
°Grapefruit	½ small	°Tangerine	1 large
°Grapefruit juice	½ cup	Watermelon	1 cup

° These fruits are rich sources of vitamin C. Try to use one of them each day.

List 4. Bread Exchanges. One exchange contains 2 Gm. protein, 15 Gm. carbohydrate and 70 calories

This list shows the different amounts of foods to use for one bread exchange:

	Amount to Use
Bread	1 slice
Biscuit, roll (2″ diam.)	1
Muffin (2″ diam.)	1
Cornbread (1½″ cube)	1
Cereals, cooked	½ cup
Dry, flake and puff types	¾ cup
Rice, grits, cooked	½ cup
Spaghetti, noodles, cooked	½ cup
Macaroni, etc., cooked	½ cup
Crackers, graham (2½″ sq.)	2
Oyster (½ cup)	20
Saltines (2″ sq.)	5
Soda (2½″ sq.)	3
Round, thin (1½″)	6
Flour	2½ tbsp.

	Amount to Use
Vegetables	
Beans and peas, dried, cooked (lima, navy, split pea, cowpeas, etc.)	½ cup
Baked beans, no pork	¼ cup
Corn	⅓ cup
Popcorn	1 cup
Parsnips	⅔ cup
Potatoes, white	1 small
Potatoes, white, mashed	½ cup
Potatoes, sweet or yams	¼ cup
Sponge cake, plain (1½″ cube)	1
Ice cream (Omit 2 fat exchanges)	½ cup

Use these foods carefully because they have a lot of sugar.

List 5. Meat Exchanges. One meat exchange contains 7 Gm. protein, 5 Gm. fat and 75 calories

This list shows the different amounts of foods to use for one meat exchange:

	Amount to Use
Meat and poultry, (medium fat)	1 oz.
Beef, lamb, pork, liver, chicken, etc.	
Cold cuts (4½″ x ⅛″)	1 slice
salami, minced ham, bologna, liverwurst, luncheon loaf	
Frankfurter (8-9 per lb.)	1
Egg	1

	Amount to Use
Fish: haddock, etc.	1 oz.
Salmon, tuna, crab, lobster	¼ cup
Shrimp, clams, oysters, etc.	5 small
Sardines	3 medium
Cheese, cheddar type	1 oz.
Cottage	¼ cup
*Peanut butter	2 tbsp.

* Limit peanut butter to one exchange a day unless the carbohydrate in it is allowed for you in your meal plan.

List 6. Fat Exchanges. One fat exchange contains 5 Gm. fat and 45 calories

This list shows the different foods to use for one fat exchange:

	Amount to Use		Amount to Use
Butter or margarine	1 tsp.	French dressing	1 tbsp.
Bacon, crisp	1 slice	Mayonnaise	1 tsp.
Cream, light	2 tbsp.	Oil or cooking fat	1 tsp.
Cream, heavy	1 tbsp.	Nuts	6 small
Cream cheese	1 tbsp.	Olives	5 small
Avocado (4" diam.)	⅛		

Note: See Chapter 50 for recipes based on exchange allowances.

(*Continued from p.* 302)

argue that so long as weight is maintained and no ketones formed in excess, the patient is metabolizing enough carbohydrate and other foods for his energy needs. The remainder of the carbohydrate which is not metabolized and spills into the urine is considered as waste matter and not harmful. The great advantage of this regimen is that the patient is not continually aware of his restrictions and therefore can live a more normal life both physically and emotionally. The arguments for and against this freedom in diet are hotly debated, and long-time studies are in progress to determine its value.

INSULIN THERAPY

Insulin, as already stated, is the internal secretion of the pancreas, produced by the islands of Langerhans. The discovery that insulin could be isolated from the pancreas of an animal, the development and the technic of its administration and the development of commercial standards for its production together form one of the greatest contributions of the century to medical science. Insulin is sold on the basis of its unit content, the commercial unit used being the same as that originally designed in the experimental laboratory. An insulin unit is ⅓ the quantity which will cause a 2-kilogram (4.4 lb.) rabbit to reach the blood-sugar level of .045 per cent—the convulsive level—within 5 hours. In the human being it will cause one or more grams of carbohydrate to be oxidized —usually 1½-2 Gm., but this varies with the patient and his condition. Insulin is sold in different strengths varying from 20 to 80 units per cubic centimeter. The quantity required by an individual varies with his ability to burn carbohydrate. Sufficient insulin is given to make up the deficit between the patient's tolerance and his requirements for carbohydrate.

It is true that exercise increases the demand for and ability to burn carbohydrate. Other factors, such as strong emotion, worry or overwork, may also affect the insulin requirement. These may have the effect of

ADA MEAL PLAN No. 4

For______________________________

Use only as your doctor prescribes. Carbohydrate 220 Gm., protein 90 Gm., fat 100 Gm.: calories 2,200

This meal plan has been prepared to use with the Meal Planning Booklet.

YOUR FOOD FOR THE DAY

Amount	*Kind of Food*	*Choose From*
1 pint	Milk	List 1
Any amt.	Vegetable Exch. A	List 2A
1	Vegetable Exch. B	List 2B
4	Fruit Exchanges	List 3
10	Bread Exchanges	List 4
8	Meat Exchanges	List 5
8	Fat Exchanges	List 6

Divide this food as follows:

YOUR MEAL PLAN

Breakfast

1 Fruit Exchange from List 3
2 Meat Exchanges from List 5
2 Bread Exchanges from List 4
3 Fat Exchanges from List 6
Coffee or tea (any amount)

Lunch or Supper

2 Meat Exchanges from List 5
3 Bread Exchanges from List 4
Vegetable from List 2A (any amount)
1 Fruit Exchange from List 3
2 Fat Exchanges from List 6
1 cup milk from List 1*
Coffee or tea (any amount)

Dinner or Main Meal

3 Meat Exchanges from List 5
3 Bread Exchanges from List 4
Vegetable from List 2A (any amount)
1 Vegetable Exchange from List 2B
2 Fruit Exchanges from List 3
3 Fat Exchanges from List 6
Coffee or tea (any amount)

Bedtime

1 cup milk from List 1*
2 Bread Exchanges from List 4
1 Meat Exchange from List 5

* Part of milk may be used for coffee, tea or for cereal.

raising the blood sugar and thereby disturbing the patient's carbohydrate balance.

The insulin described above is now known as unmodified or regular in contrast with modified forms of it known as crystalline zinc, protamine zinc, globin and NPH insulins described below.

CRYSTALLINE ZINC INSULIN

Research proved that insulin extracts could be crystallized and that the addition of very small amounts of zinc facilitated the process. This is a purer product than the first or regular insulin, inasmuch as it has a lower protein content. Crystalline insulin is supposed to give fewer allergic reactions; otherwise, the action of this product is very similar to that of the regular or unmodified insulin. Both act quickly and are effective for approximately 6 to 8 hours.

PROTAMINE ZINC INSULIN

Protamine zinc insulin was made available through the research of Hagedorn, of Denmark, and others. It is a precipitate of the regular or unmodified insulin and a protamine which originally was obtained from the sperm of fish. Zinc in minute

Sample Menus

(These menus show some of the ways exchange lists can be used to vary the meal plan. The exchange lists and recipes may be found in the Meal Planning Booklet)

Breakfast

Orange juice—½ cup
Eggs—2
Toast—2 slices
Butter—3 tsp.
Coffee—2 tbsp. evaporated milk†

Lunch or Supper

Ham and cheese sandwich
(cheese—1 oz., ham—1 oz., bread—3 slices, butter—1 tsp.)
Lettuce and tomato salad
Mayonnaise—1 tsp.
Apple—1 small
Milk—1 cup (8 ozs.)
Coffee or tea

Dinner

Hamburg patties—3 ozs.
Mashed potato—½ cup
Carrots—½ cup Spinach
Bread—2 slices
Butter—3 tsp.
Banana—1 small
Coffee or tea

Bedtime

Milk—¾ cup (6 ozs.)†
Peanut butter sandwich
(peanut butter—2 tbsp., bread—2 slices)

† 2 tbsp. evaporated milk equals ¼ cup whole milk. Part of the milk is taken from bedtime to use at breakfast.

Breakfast

Prunes—2 medium
Cereal, cooked—½ cup
Milk—¼ cup (2 ozs.)*
Poached eggs (2) on toast—2 slices
Butter—2 tsp.
Coffee—2 tbsp. light cream

Lunch or Supper

Bologna—2 slices
Radishes, celery, sour pickles
Potato salad (B)—1 cup (recipe Chap. 50)
Bread—1 slice Butter—1 tsp.
Grapefruit—½
Milk—1 cup (8 ozs.)
Coffee or tea

Dinner

Tomato juice—small glass
Roast lamb—3 ozs.
Steamed rice—1 cup
Green peas—½ cup
Mixed green salad
French dressing—1 tbsp.
Bread—1 slice Butter—2 tsp.
Fruit gelatin II (recipe Chap. 50)
Coffee or tea

Bedtime

Milk—¾ cup (6 ozs.)*
Graham crackers—4
American cheese—1 oz.

* Part of the milk is taken from bedtime to use at breakfast.

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quantities is added to enhance the effect of the protamine. This type of insulin is absorbed much more slowly than the original preparation produced by Banting or the crystalline zinc insulin described above. Its effect may last for a day or more, depending upon the individual, and the drop in blood sugar is more gradual. For this reason, it is advisable to give the protamine zinc insulin half an hour before breakfast and usually it is given only once a day. The distribution of carbohydrate intake may be different from what it is when regular or crystalline zinc insulin is used, as already stated.

Because it is slow of absorption, the single morning dose may not be sufficient to control the early morning glycosuria of a severe diabetic. However, this may be overcome by the combined use of the regular and the protamine zinc insulins. By its

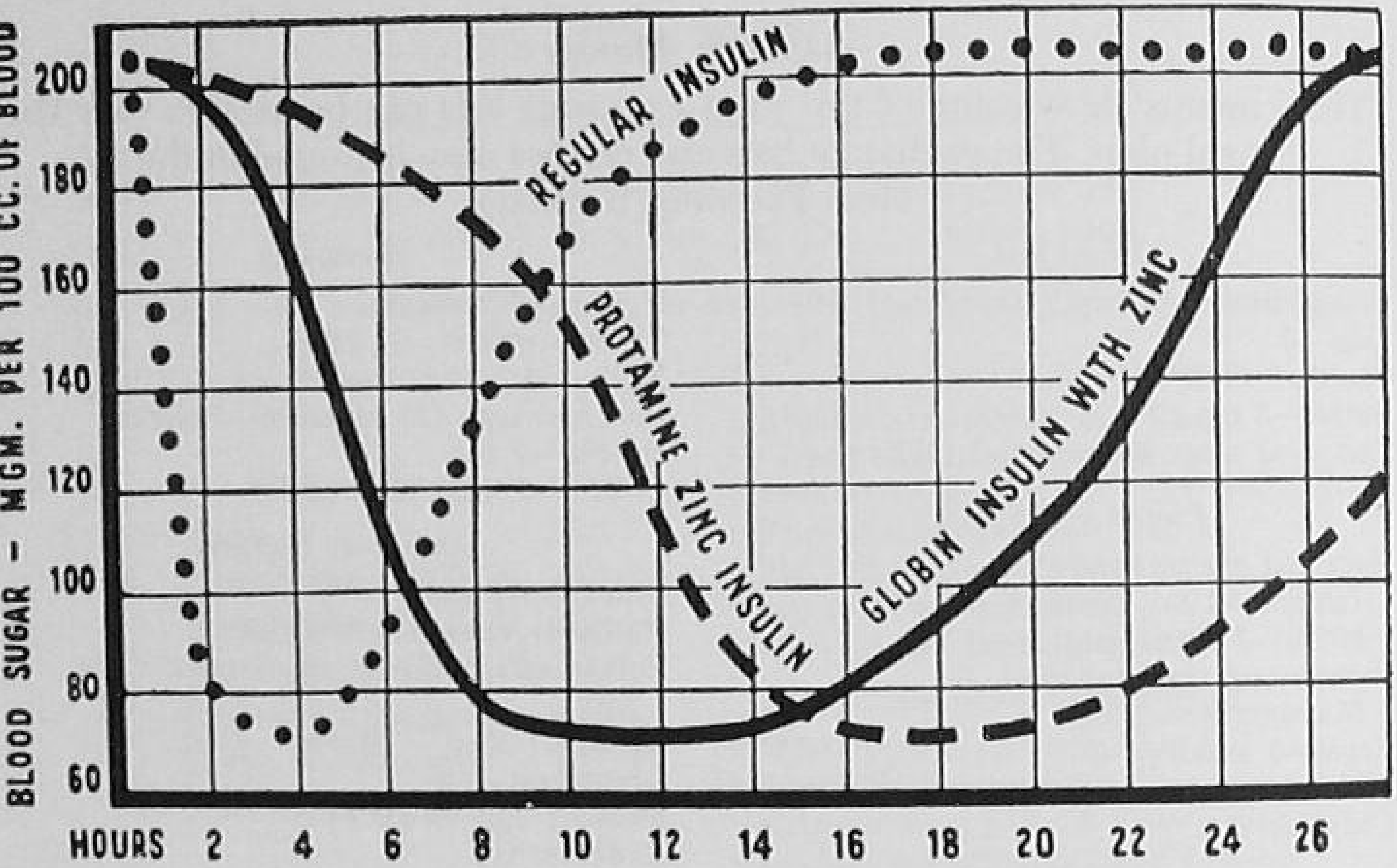

FIG. 64. The effects of comparable doses of various insulins on the blood sugar level of a fasting diabetic patient. Note the intermediate type of action of globin insulin as compared with regular insulin and protamine zinc insulin. (Burroughs Wellcome & Co., Inc.)

use, the number of injections have been reduced from as many as 4 per day to 1 or 2, and in many cases fewer units are required. Ketosis is almost completely overcome by its use.

Globin Insulin

As the name would indicate, globin insulin is a combination of an aqueous solution of insulin with the addition of the protein globin derived from hemoglobin of beef blood. This product also contains zinc chloride and is a clear solution. Its action is intermediate between the regular and the protamine insulins. Its effect is apparent after about 2 hours and reaches its maximum in about 8 hours, when it begins to wane, gradually decreasing for another 8 hours. Its effect is, therefore, continuous for approximately 16 hours. When given before breakfast, the peak of its activity is reached about midafternoon. For this reason, some of the more severe diabetics find it necessary to have a midafternoon feeding.

NPH Insulin

The most recent member of the insulin family is NPH insulin. The initials stand for Neutral Protamine Hagedorn, the last the name of the investigator who developed the original protamine insulin and who also developed this modification of it. NPH insulin resembles in its action a combination of regular and protamine insulins. It takes effect at once and is long lasting, although there

are less likely to be late reactions as with unmodified protamine insulin. The dosage may be slightly less than for unmodified protamine zinc insulin.

Insulin Administration

The total quantity of insulin given may vary from 5 to 80 units. This is given in from 1 to 4 doses daily, depending upon the needs of the patient and the type of insulin used. Usually it is given a half hour before meals. It is very important that the dosage not be changed from the doctor's orders; otherwise, one of two serious complications may arise—ketosis if too little given or insulin shock if too much is administered.

Unfortunately, insulin cannot be given by mouth because it is a protein and would be digested; therefore, it must be administered hypodermically. It usually falls to the lot of the nurse to give insulin or to teach the patient how to administer it to himself, and it is important that the nurse acquaint herself thoroughly with the methods for doing this. For convenience, directions are given in Part Four. Other procedures concerned with the disease are given also. The student is also referred to diabetic manuals. (See list of references on diabetes, Part Four.)

DIABETIC EMERGENCIES

Coma

Coma usually is caused by failure to take the insulin prescribed, or by fever and infection. If the body is unable to burn its carbohydrates so that body fats are drawn upon for energy but only partially oxidized, a condition already described as ketosis follows and may result in diabetic coma. This condition is usually slow in its onset and is characterized by nausea, vomiting, pain in the abdomen, thirst, deep breathing, a pungent odor of the breath, restlessness and, finally, unconsciousness.

The principles of treatment are (1) to ensure the burning of carbohydrate by the use of insulin, (2) to replace water and salts lost to the body because of dehydration and vomiting and (3) to give such general care as to secure the patient's survival until such time as (1) and (2) become effective.

This is carried out by rest in bed, keeping the patient warm, administering liquids (tea, coffee, hot water or broths) and insulin, with some source of carbohydrate, such as orange juice, and any other such procedures as the physician may prescribe.

Insulin Reactions

If too much insulin is given or too little food is taken after its administration, the blood sugar is decreased and the patient suffers a reaction or shock, characterized by a sudden onset, hunger, weakness, pallor, sweating, trembling and double vision. The patient may become hysterical, drowsy and then unconscious. It is important that this condition be treated quickly. Carbohydrate must be administered at once. Orange juice or sugar gives quick relief. Patients taking insulin are advised to carry two lumps of sugar or hard candy for such emergencies.

The treatment for reactions from the modified insulin differs from the treatment for reactions from the regular insulin in that the carbohydrate must be given over a longer period

of time. Orange juice or some other carbohydrate that is quickly absorbed should be given immediately but followed shortly by a form that is more slowly absorbed, such as milk and crackers or toast. It may be necessary to repeat the administration of carbohydrate that is absorbed rapidly for a period of several hours.

Surgery

Diabetics can now be operated upon with a comparative degree of safety. In emergencies, as in acute, operable infections, there need be no delay in operating. In these cases, the patient is given insulin and intravenous fluids and glucose. When there is time to prepare the patient, the preoperative treatment should consist of making the patient free from ketosis and his urine free of sugar and seeing that his glycogen, fluid and salt reserves are adequate. A weighed diet accompanied by the use of insulin is indicated in such cases.

On the morning of operation both breakfast and insulin are withheld. Occasionally, a small dose of insulin is injected before the patient goes to the operating room.

After the operation, glucose and fluids are given intravenously with sufficient insulin to metabolize the glucose. Oral feeding is started as early as possible, usually in 24 hours. At first fruit juices, ginger ale, tea and broth are given. Later a more liberal diet is resumed.

DIABETES IN CHILDREN

Although in general the child diabetic is given the same treatment as the adult, there are some differences which should be noted. The diet for the child must not only meet his needs when the diabetes is first discovered, but it must also allow for periodic readjustment as he grows and develops. The growing child's needs in terms of calories must be based on not only the basal metabolism but also muscular activity plus growth. The following table[12] gives the approximate caloric requirements at various age levels.

Age	Total Calories
1 year	1,000
2 years	1,100
3 years	1,200
4 years	1,300
5 years	1,400
6 years	1,500
7 years	1,600
8 years	1,700
9 years	1,800
10 years	1,900
11 years	2,000
12 years	2,100
13 years	2,200
14 years	2,300
15 years	2,400

Particularly in the adolescent years, when girls and boys grow very rapidly, it is essential that the diet keep pace with the nutritional needs, and insulin be increased accordingly.

Excitability and irritability are factors which play a greater role in the treatment of the diabetic child than in that of the adult. Above all, it should be remembered that great tact, sympathy and understanding are necessary in dealing with such children.

[12] Diabetes Mellitus, Indianapolis, Eli Lilly & Company, 1947.

DIABETES AND PREGNANCY

Since the introduction of insulin, the hazards of pregnancy in the diabetic woman have been greatly reduced. Of course, it is necessary for her to adhere very strictly to her diet, which, however, must be adjusted from time to time to meet the growth demands of the fetus (see Chap. 12) and to prevent depletion

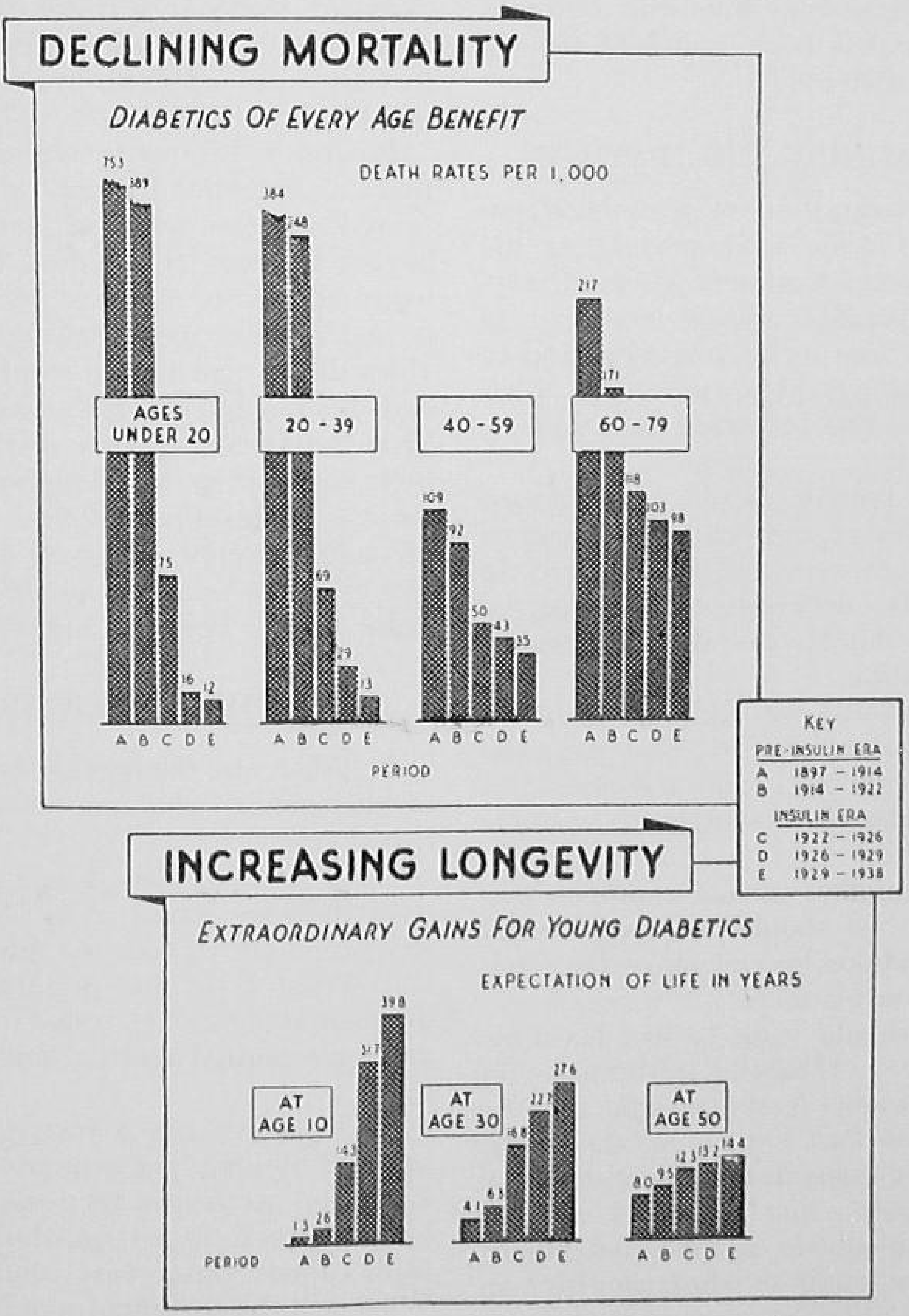

Fig. 65. Prognosis in diabetes; a summary of 40 years of progress. (Joslin, E. P.: Diabetes in the 1940's, George F. Baker Clinic, Boston, and Metropolitan Life Insurance Company, New York)

of the maternal stores of glycogen. White and Hunt[13] have been able to reduce to a great degree the occurrence of fetal death and toxemia in pregnancy of diabetic mothers by the use of female sex hormones in those patients in whom the hormone balance has been found to be distinctly abnormal.

TEACHING THE PATIENT

The education of a diabetic patient is quite as important as the therapeutic treatment given. Everything possible should be done to interest him in his treatment and to teach him at his own level of intelligence. The following procedure is advised:

The patient should be informed gradually of the principles involved in his disease and encouraged to make the necessary adjustments.

He should be warned against over-eating.

He should be urged to keep his body weight slightly below the average for height, build and sex.

He should be taught to evaluate his diet.

Eventually, as his condition improves, he should be taught what substitutions he can make for foods listed on his diet.

He should learn to test his urine for sugar. (Definite instructions for the Benedict Test for sugar may be found in Part Four or in any of the diabetic manuals mentioned in list of references under diabetes.)

Upon advice of the physician he must be taught to administer his own insulin. (See directions in Part Four.)

[13] White, Priscilla, and Hunt, Hazel: J.A.M.A. 115:2039, 1940.

He should be warned of the danger of coma and insulin reaction, of the symptoms and the treatment for each.

He must be taught that he must live a simple life, avoid undue excitement, worry and strain; that rest, sleep and exercise are important; that he must eat leisurely, regularly and on time.

Prognosis. It must be remembered that a diabetic patient is never "cured" in the sense of no longer having to consider his diet. Insulin, wonderful as it is, does not cure—it merely aids; nevertheless, it enables the patient to live comfortably and to engage in life's activities. That the life expectancy of the diabetic has been greatly lengthened by the use of insulin is shown by the preceding graphic Summary of Progress of Forty Years at the George F. Baker Clinic, Boston. (Fig. 65.)

STUDY QUESTIONS

1. What are thought to be some of the predisposing causes of diabetes?
2. What symptoms does a patient with diabetes have? Why does he show each one of these symptoms?
3. What tests are performed to diagnose diabetes? Describe the tests and give normal and pathologic results.
4. A patient has a fasting blood sugar of 300 mg. per cent and shows sugar and acetone in his urine. What has happened to his metabolism to bring about these two conditions? What will the treatment possibly be?
5. What percentage of carbohydrate is metabolized as glucose in the body? of protein? of fat? How much

glucose will the body obtain from the Pattern Dietary which contains 90 Gm. of protein, 100 Gm. of fat and 200 Gm. of carbohydrate?

6. A diabetic patient weighs 120 pounds. His ideal weight is 125 pounds. How many calories should he have per day? How much protein?

7. The carbohydrate allowance for a diabetic patient is 150 Gm. He is being given protamine zinc insulin. How will the carbohydrate of his diet probably be divided for the day?

8. Plan a diabetic diet with the following diet order: Protein 75, fat 110, carbohydrate 200, carbohydrate divided for NPH insulin. The patient is a man with a large appetite. Use Table 1, Part Four, for food composition figures. Repeat, using the Exchange Lists in this chapter. Are the two diets very different?

9. What is meant by a 15-per-cent fruit?

10. What foods are permitted for use on a diabetic diet? Which should be avoided? Give 5 substitutions that a diabetic can make for a slice of bread.

11. What is meant by the chemical regulation of diabetes? The clinical regulation? Why is there controversy over these two methods of regulation?

12. What is meant by a "free" diabetic diet? What advantages are claimed for it?

13. What foods should be included in the diabetic diet to make it nutritionally adequate?

14. What is insulin? How many kinds of insulin are there? How do they differ?

15. What is a diabetic ketosis? What causes this condition? How is it treated?

16. How are diabetics prepared to undergo surgery?

17. What differences are there between the treatment of diabetic children and diabetic adults?

18. What precautions should be taken by a diabetic patient who is pregnant?

19. A diabetic patient is to be discharged. What should he have been taught by the time he is ready to go home? What is the nurse's responsibility in teaching diabetic patients?

Gastric Disorders

GENERAL DISCUSSION
DIAGNOSTIC TESTS
GASTRIC TEST MEALS
HISTAMINE TEST
ROENTGENOGRAPHY
FUNCTIONAL DISORDERS OF THE STOMACH
INDIGESTION
FUNCTIONAL DISORDERS OF THE STOMACH (CONT.)
HYPERCHLORHYDRIA
BLAND DIET
HYPOCHLORHYDRIA, ACHLORHYDRIA AND ACHYLIA GASTRICA
ORGANIC DISEASES
ACUTE AND CHRONIC GASTRITIS
CANCER OF THE STOMACH

GENERAL DISCUSSION

Gastric diseases usually are classified as organic and functional. Organic diseases are those in which a definite pathologic change has occurred in the structural tissues, as in ulcer and cancer. Functional disorders are disturbances of the nerve control of digestion, whether sensory, motor or secretory in nature.

Normally the stomach receives the masticated food, churns and mixes it with the gastric juice and then expels it through the pylorus. In order to perform these functions, wavelike movements, known as peristalsis, pass regularly at intervals of about 22 seconds from the cardiac end of the stomach to the pylorus. In due time the pyloric sphincter allows the chyme to pass into the intestinal tract. All this constitutes a complicated process which is under the control of the nervous system. Disturbances are usually motor or secretory, or both. The motility or the ability of the stomach to pass food into the intestinal tract may be accelerated or delayed; or the gastric juice may be secreted in excessive or insufficient amounts.

Relation to Other Diseases

Although classed as functional disturbances, many of the gastric disorders may be due to pathologic conditions in other organs. It has been well said that the stomach is a mirror reflecting the ailments of the whole abdominal region and other parts of the body as well. Chronic appendicitis, gallbladder disease, nephritis and even pulmonary tuberculosis are known to be causes of gastric disorders. Likewise, many of the neuroses, as well as the psychoses, give rise to gastric symptoms. Of course clinical tests have been developed to determine the causes of these gastric disurbances (see below).

DIAGNOSTIC TESTS

Gastric Test Meals

These tests consist of chemical examinations of the contents of the stomach during the process of digestion. One of more foods and a liquid, both in definite amounts, are given, usually on a fasting stomach. After a predetermined time, allowed for digestion, the contents are removed by a tube and later examined.

Ewald-Boas Test Breakfast. This test, administered in the morning before the patient has received any other food, is one of the best known of these tests. First, the fasting stomach contents are withdrawn and examined for hypersecretion, food stasis and other abnormal conditions. Next, a test meal is given, consisting of: 1 roll or 2 slices of white bread or 2 slices of toast or 4 soda crackers; 2 glasses of water or weak tea. After 45 minutes to an hour, the meal is extracted. The material is examined as to gross appearance and admixtures, such as blood and bile, and also as to total quantity. An analysis is made of both the free hydrochloric acid and the total acidity. From the above examination the following interpretations may be made:

Total Quantity—Less than 20 cc. indicates accelerated evacuation
Over 100 cc. may indicate stasis
Hydrochloric Acid—Above normal indicates hyperchlorhydria
Below normal indicates hypochlorhydria
Absence of acid indicates achlorhydria

The fractional method, advocated by Rehfuss and his associates, has been recommended as giving more nearly accurate results than a single aspiration or withdrawal. By this method the gastric contents are withdrawn at frequent intervals following the meal and chemical analysis made of each specimen.

Histamine Test

Histamine, a drug, is the most powerful stimulus known for the secretion of gastric juice. Therefore, it is used to determine the ability of the stomach to secrete the necessary acid and pepsin, especially if the test meal shows evidence of achlorhydria. It is given subcutaneously after a 12-hour fast and after the contents of the stomach have been removed by tube.

Samples of gastric juice are aspirated at 15-minute intervals during the period of active secretion and then are titrated for total and free acidity. The results are compared with normal figures. If much above normal and if the period of secretion is prolonged, ulcer may be suspected; below normal may indicate other types of gastric disease.

Roentgenography

Roentgenography of the stomach is now a most important diagnostic procedure. This may be done by x-ray photography or by direct examination with a fluoroscope. By this means the progress of an opaque "meal" of barium sulfate may be followed through the entire digestive tract, and the motility, including peristalsis, the emptying time, the general tonus, including cardiospasm or pylorospasm, defects of outline indicative of ulcer or carcinoma, and other signs of abnormalities can be studied in detail. The barium meal is

given in the morning or at least 12 hours after the taking of food or drink.

FUNCTIONAL DISORDERS OF THE STOMACH

Discomfort following meals is common. Since disturbed digestion may lead to chronic conditions, it is important to determine the cause, especially if the attacks recur.

Indigestion

The chief causes of disturbed digestion are:

- Improper selection of food
- Overeating and undereating
- Rapid eating
- Insufficient mastication
- Improper food preparation
- Fatigue
- Mental strain
- Emotional upsets
- Lack of exercise
- Idiosyncrasies to certain foods

Excessive fat in the diet may inhibit the secretion of the gastric juice and, therefore, delay digestion unduly, permitting unfavorable bacteriologic changes to take place in the meantime. Fried foods, heavy salad dressings, rich pastries, butter, cheeses, nuts and certain fatty fishes are frequent offenders.

Concentrated sweets may irritate the alimentary tract. Candy which is taken between meals or upon an empty stomach, cake with heavy icing and puddings rich with sweets and fats are conducive to digestive disturbances.

Gas-forming fruits and vegetables may be difficult to digest, either because of coarse cellulose or because of their volatile oils.

Acids and spices also may cause discomfort by increasing the acidity of the gastric contents.

Certain foods have been labeled by experience as difficult to digest, although the reason is not always clear. Foods which may cause gastric discomfort are lobster, crabs, sardines, peanuts, some other nuts, cabbage (if overcooked), corn, cucumbers, raw apples, onions, garlic and pickles. The excessive use of strong alcoholic beverages is also a common cause of acute indigestion and, if indulged in frequently, may lead to acute and chronic gastritis.

Improper Eating. Too much food taken at any one meal or too much for the entire day is a tax upon the digestive functions. Also, an inadequate diet, often self-imposed by the elimination of one food after another because of some imagined or reputed ill effect, is equally bad. Rapid eating, without sufficient mastication, interferes with salivary digestion. Improper food preparation may affect digestion adversely. Undercooking, especially of starchy foods and of some meats such as veal and pork; overcooking, particularly of vegetables, and the frying of foods at too low a temperature, with the result that the fat penetrates the food—all are to be avoided. By-products of overheated fats are also irritating.

Predisposing Factors. Fatigue, worry, mental strain and emotional stress have a marked effect upon the digestive functions. In such circumstances the diet should be light and the meals simple. Lack of exercise often affects the digestive powers. The sedentary person seldom can digest properly the same amount

and kind of food that can be assimilated by the active person. Lack of B vitamins may decrease muscle tone and thus affect motility.

Idiosyncrasies as to certain foods are discussed in Chapter 26.

Hyperchlorhydria

Hyperchlorhydria or hyperacidity, while not a disease entity, is a condition characterized by excess acidity of the gastric contents and by epigastric distress. An excess of free hydrochloric acid is irritating to the mucous lining of the stomach and may cause discomfort. Some stomachs are much more sensitive to the acid than others. Since the normal degree of acidity varies materially with the individual and with age, it is difficult to express numerically what is an excess. This is best determined by testing the individual.

Physicians differ as to the cause of this condition. Some are strongly of the opinion that it is due to a disturbance of the motor function rather than of the secretory function, believing that the retarded emptying of the stomach permits a longer secretory response. Whatever the cause, it is known that the nature of the food intake will remedy or at least ameliorate the condition, making the patient more comfortable.

Dietary Treatment

The diet should be bland, nonstimulating and nonirritating. Fats such as cream and butter are well tolerated, as they depress secretion and delay motility. Protein foods, especially milk, eggs, the mild, soft cheeses and tender meats are easily digested. Fried foods, concentrated sweets, rich desserts, pickles, vinegar, spices and condiments should be avoided. Acid fruits and fruit juices may cause distress. Alcoholic beverages are contraindicated. Some physicians also restrict vegetables and fruits containing considerable roughage.

The following outline summarizes the important points in the dietary treatment of many gastric disorders other than hyperchlorhydria:

Bland Diet

Principles:

1. Low or soft residue and connective tissue.
2. Little or no condiments, except salt in small amounts.
3. Low in acid content.
4. Foods simply prepared.

Foods Allowed:

Milk	Milk, cream.
Cheese	Cream, cottage and other soft, mild cheeses.
Fats	Butter and margarine.
Eggs	Boiled, poached, scrambled in double boiler.
Meat, fish, fowl	Roast beef and lamb; broiled steak, lamb or veal chops; boiled, broiled or roast chicken; fresh tongue; liver; sweetbreads; baked, boiled or broiled fish.
Soups	With milk or cream sauce foundation.

Bread, cereals, Italian pastes	White bread and rolls, crackers, all refined cereals; macaroni, spaghetti, noodles.
Vegetables	Potatoes, peas, squash, asparagus tips, carrots, tender string beans, beets, spinach. (In severe cases these vegetables are puréed.)
Fruits	Orange juice, ripe bananas, avocados, baked apple (without skin), apple sauce, canned peaches, pears, apricots, white cherries, stewed prunes.
Desserts	Custard, junket, ice cream, tapioca, rice, bread or cornstarch pudding, gelatin desserts, junket, sponge cake, plain cookies, prune, apricot or peach whip.
Beverages	Milk, buttermilk, cocoa, malted milk, fruit juices (if tolerated), coffee or tea (if allowed).

To Be Avoided:

Fats	Fried or fatty foods.
Meat, fish	Smoked and preserved meat and fish; pork.
Vegetables	All raw; all cooked except those listed above.
Fruits	All except those listed above.
Desserts, sweets	Pastries, preserves, candies.
Beverages	Alcoholic beverages; carbonated drinks unless prescribed by the doctor.
Condiments	Pepper, other spices, vinegar, ketchup, horseradish, relishes, gravies.

TYPICAL MENU FOR BLAND DIET

Breakfast	*Dinner*	*Supper*
Banana, ripe	Roast lamb	Cream of potato soup
Farina with milk	Mashed potatoes	Scrambled eggs
Egg (1), poached	Peas	Fresh spinach
White bread toast	White bread	White bread
Butter or margarine	Butter or margarine	Butter or margarine
Coffee or substitute	Canned pears	Apple sauce with sugar cookies
Cream	Tea or milk	Milk
	Cream	Small glass orange juice
	Small glass tomato juice	

Heartburn. For the treatment of heartburn, a frequent symptom of gastric disturbances, a dry diet with limitation of breadstuffs is often beneficial. No beverages are served with meals.

Hypochlorhydria, Achlorhydria and Achylia Gastrica

The conditions known as hypochlorhydria, achlorhydria and achylia gastrica represent varying degrees of

diminished secretion of digestive factors in the stomach. As the name indicates, in hypochlorhydria the acid is below normal, but some free hydrochloric acid is present; in achlorhydria no free hydrochloric acid is found, but some combined acid is present; in achylia gastrica both acid and digestive enzymes are lacking. The terms "achlorhydria" and "achylia gastrica" are often used interchangeably. Achylia gastrica is a characteristic symptom of pernicious anemia and is discussed in the chapter on anemias.

As in the case of hyperchlorhydria, physicians differ as to the importance to be attached to a diminished amount of acid secreted by the stomach. Some are inclined to believe that this condition is not incompatible with good health, while others believe it to be associated with other disturbances, such as pernicious anemia.

Nevertheless, while the causes are being investigated, the comfort of the patient must be considered, which means of course that the diet must be adjusted to meet his needs.

Dietary Treatment

The bland diet with some modifications is indicated in cases of diminished gastric secretion. Fats are limited as they tend to depress the secretion of gastric juice. Iced beverages and very cold foods are contraindicated for the same reason. Cultured milks sometimes are tolerated better than sweet milk. Fruit juices and broths stimulate the production of gastric secretion and should be used freely. Otherwise the suggestions for the bland diet on the two preceding pages should be followed.

Hydrochloric acid usually is prescribed to make up, in part, the deficiency in the gastric secretion.

ORGANIC DISEASES

Acute and Chronic Gastritis

Acute Gastritis. There is some difference of opinion as to whether acute gastritis is a functional or an organic disease. Gastritis is essentially an inflammation of the gastric mucosa. Acute gastritis may follow the ingestion of toxic substances, such as alkalis, strong acids, alcohol and certain drugs. In sensitive individuals, certain foods produce congestion which amounts to actual inflammation.

The treatment should include elimination of the offending substance as soon as possible. This is accomplished by induced vomiting or by lavage and is followed by fasting for an appropriate interval. During this time, fluids are usually given intravenously rather than by mouth, although bits of ice may be held in the mouth to quench severe thirst.

A liquid diet should be given the first and possibly the second day following the fast. A start should be made by giving one teaspoonful of a bland liquid such as homogenized milk, or buttermilk, or a strained gruel, and repeating in half an hour if no ill effects result from the first feeding. Both the amount and the interval should be increased until from 3 to 6 ounces are given at 2-hour intervals. Solid foods should be added to the diet very gradually, crisp dry toast or crackers being the first addition to the liquid food. Toasted cereal flakes, well-cooked cereals, such as rice or Cream of

Wheat, preferably cooked with milk, and a soft-cooked egg may be given on the third and the fourth days of feeding. A light diet (see Chap. 17) should be used when the patient's condition permits. This may be on the third, the fourth or the fifth day, but it is wise to go slowly and so reduce the chances of a relapse. Usually these illnesses last only a few days.

Chronic Gastritis. Chronic gastritis may accompany organic gastric lesions, such as ulcer and cancer, or may be secondary to some other disease, such as myocardial insufficiency and nephritis, but the etiologic factors are usually the same as for acute gastritis.

THE TREATMENT consists in first discovering the cause and treating the patient accordingly. If the contributing cause is improper eating or drinking, he must be convinced that recovery depends upon the avoidance of the specific factor causing the irritation. The food must be easily digested and be simply and appetizingly prepared. A bland or convalescent ulcer diet (see Chap. 23) usually will meet the needs.

CANCER OF THE STOMACH

Delayed Diagnosis. Because the onset usually is very gradual and there are no distressing symptoms in the early stages of cancer of the stomach, frequently it is overlooked until too late to effect a cure. For this reason, any continued abdominal discomfort should be investigated, even though seemingly inconsequential. This is another reason why a periodic physical examination is of importance.

Symptoms and Diagnosis. Lack of appetite over a considerable period of time with loss of weight and strength are symptoms suggestive of carcinoma. Vomiting may occur, and sometimes newly acquired constipation may be a symptom. The absence of free hydrochloric acid in the gastric contents is suggestive, although in the earlier stages it may be increased. Occult blood is frequently present in the stools. The most important method in diagnosing cancer is by roentgenogram. The early discovery of this condition, when surgical intervention is more likely to be successful, is of utmost importance.

Dietary Adaptations. When an operation has been performed, the diet should follow that outlined in the chapter on preoperative and postoperative diets.

In inoperable carcinoma of the stomach, patients often feel that if they can only eat they will get well, and therefore the diet is difficult to prescribe. A bland or a convalescent ulcer diet is indicated, or even a liquid diet, particularly if there is obstruction or bleeding. However, the patient's morale may be benefited most by serving a regular house diet for as long a time as possible and letting him choose from his tray what appeals to him.

STUDY QUESTIONS

1. What is the procedure for doing a gastric analysis? What observations are made in such a test?

2. A patient complains that he is troubled with indigestion. What are the possible causes of his dyspepsia? What may the doctor advise as to his diet?

3. What is meant by hyperchlorhydria. How does this differ from acidosis?

4. A patient is discharged on a bland diet. He has asked that you tell his wife what he should eat at home. Outline the instructions you would give her.

5. How is acute gastritis treated? Chronic gastritis?

6. What dietary measures can be used for patients who have inoperable cancer of the stomach?

7. Show how a bland diet can meet all the requirements for adequate nutrition.

Peptic Ulcer

GENERAL DISCUSSION
CAUSES OF PEPTIC ULCER
SYMPTOMS
TREATMENT
MEDICAL AND SURGICAL
TREATMENT (CONT.)
DIETARY
IN THE ACUTE STAGE
CONVALESCENT ULCER DIET
BLEEDING ULCERS

GENERAL DISCUSSION

Gastric ulcer is a term used to designate an eroded lesion in the stomach, usually occurring along the lesser curvature or near the pylorus.

Duodenal ulcer is the same type of lesion, but it is found in the duodenum. It is much more common than gastric ulcer.

Common Problems. Whether in the stomach or in the duodenum, ulcers need similar treatment; therefore, they are considered together in this chapter under the name of peptic ulcer. They are always troublesome and often endanger the life of the patient, as hemorrhage and perforation are likely to occur. Cancer, too, may result, most frequently from gastric ulcer.

CAUSES OF PEPTIC ULCER

Many theories have been advanced as to the cause of these lesions. Rivers[1] groups the probable causes as follows:

1. **Neurogenic Factor.** Some believe that disturbances in the nervous system cause impoverishment of the blood supply, leading to mucosal erosions.

2. **Circulatory disturbances** in the veins and the arterioles of the submucosa, resulting in necrosis, which is followed by ulceration due to the digestive action of the gastric juice.

3. **Erosion of Tissue by Acid.** Abnormally concentrated gastric juice is known to produce erosion, but why the mucosa is unable to withstand the attack of acid in some individuals is not clear.

4. **Inflammation and Infection.** This may be a possible result of focal infection.

5. **Acid Factor.** After the initial lesion has been produced by any of the above causes, it is assumed that the most important perpetuating factor in the ulcer patient is high and continuous gastric acidity.

Wolf and Wolff[2] reported their observations on the gastric mucosa in a patient with a gastric fistula. They found that "emotional conflict involving anxiety, hostility and re-

[1] Rivers, A. B.: Am. J. Nursing **37**: 711, 1937.

[2] Wolf, S., and Wolff, H. G.: J.A.M.A. **120**:670, 1942.

sentment was accompanied by accelerated acid secretion, hypermotility, hyperemia and engorgement of the gastric mucosa, resembling 'hypertrophic gastritis.'" Therefore, they conclude that "the chain of events which begins with anxiety and conflict and their associated overactivity of the stomach and ends with hemorrhage or perforation is that which is involved in the natural history of peptic ulcer in human beings."

SYMPTOMS

Pain in the epigastrium, occurring more or less regularly from 2 to 5 hours after meals, is characteristic of peptic ulcer. It is usually of a burning or gnawing type and is relieved by food or alkalis such as sodium bicarbonate. If the ulcer is in the cardiac end of the stomach, the pain will occur very soon after the taking of food. The presence of an ulcer is determined by examination by roentgenogram or fluoroscope.

Hyperchlorhydria and hypersecretion of gastric juice is usually found on analysis of the stomach contents. If hypo-acidity occurs, gastric cancer is more likely to be suspected.

Hemorrhage or Perforation. Sometimes hemorrhage or perforation is the first noticeable symptom; or these may occur if the ulcer is not treated. Occult blood will be found in the stools if there is bleeding of the lesion.

In advanced cases, *loss of weight* and a decreased level of serum protein are often seen.

Recurrences of attacks lasting for a few weeks occur more or less intermittently for years. They may be precipitated by severe emotional strain, by the excessive use of alcohol or by indiscretions of diet.

TREATMENT

Medical and Surgical

Rest, both physical and mental, is demanded in all severe cases. This may mean hospitalization or at least rest in bed for a period ranging from a few days to several weeks. Many of the ambulatory patients are advised to make a change of occupation if their present work requires heavy lifting or pulling.

Medication usually consists of antacid (alkali) and antisecretory drugs intended to neutralize or inhibit the excess gastric acid and the pepsin activity.

Many surgeons feel that operative measures are indicated in peptic ulcer, but it is generally agreed that medical treatment in the early stages is warranted, at least as a trial measure.

Dietary

Of all the medical treatments prescribed, undoubtedly careful dieting is the most important. The characteristics of the diet are as follows:

1. Mechanically and chemically nonirritating foods.
2. Foods that neutralize and inhibit acidity.
3. Frequent and small feedings.
4. Gradual but ultimate restoration to an adequate diet.

A mechanically nonirritating diet is low in residue and therefore free from substances likely to cause an abrasion or irritation when coming in contact with the eroded surface.

A chemically nonirritating diet is free from condiments: pepper,

mustard, spices; low in sweets (only small amounts of sugar or honey being allowed); free from strong acids (vinegar, pickles, strongly acid fruits and juices); low in coffee and caffeine-containing beverages which research[3] seems to indicate stimulate gastric secretion; and low in meat extractives—no broths, soups or gravies being allowed until convalescence is well established. Alcohol and tobacco are prohibited for the same reason.

Foods that lower the gastric acidity are proteins and fats. The protein combines with the free acid and thus neutralizes the acidity; and certain easily digested fats inhibit the secretion of the hydrochloric acid. Therefore, milk, eggs, cream, butter and olive oil are especially valuable in the treatment of peptic ulcer.

Frequent and Small Feedings Are Important. Some dietary plans call for small hourly feedings; others, for feedings every 2 hours, or for 6 feedings per day. Food in the alimentary tract takes up the excess acid which otherwise would excite the pain so characteristic of ulcer; of course, with frequent feedings it is necessary to give small quantities of food and to plan the diet carefully to meet all nutritive requirements.

[3] Roth, J. A., Ivy, A. C., and Atkinson, A. J.: J.A.M.A. 124:814, 1944.

The normal dietary requirements must be met in this disease as well as in all others. The initial diet lacks some of the essentials, but these deficiencies should not long be overlooked. Vitamins and minerals must be given careful consideration in planning the diets. Ascorbic acid should be prescribed if fruit rich in this factor must be omitted.

Diet in Acute Peptic Ulcer

For many years the Sippy diet[4] or modifications of it have been used successfully in the treatment of peptic ulcer. This diet begins with frequent feedings of milk or milk and cream, usually 3 oz. given every hour, and alternated on the half hour with alkaline powders. The feedings may be given from 7 A.M. to 7 P.M. or may be continued during the evening and the night if pain persists.

Diet in Convalescent Peptic Ulcer

As the pain subsides, soft-cooked eggs, refined cereals, custard and junket are added one by one to the above regime. Gradually other foods such as milk toast, cream soups and cottage or cream cheese are added or substituted. Meals should remain small. If the patient continues to improve, he is placed on a six-feeding convalescent ulcer diet.

[4] J.A.M.A. 64:1625, 1915.

Progressive Peptic Ulcer Regimen

In the Acute Stage:

Milk or milk and cream .... 3 oz. every hour alternating with alkaline powders on the half hour.

Supplements (added one at a time):

Eggs .... Soft cooked or poached, once or twice daily.

Cereal	Cream of Wheat, rice, once or twice daily.
Custard	Substituted for an egg.
Junket	In addition to one of the milk and cream feedings.

Later Additions:

Milk toast	Made of white bread toast and warm milk or milk and cream. May be substituted for cereal.
Cream soup	Made of bland, low residue vegetables such as peas, carrots, spinach and asparagus.
Cheese	Cottage or cream cheese. May be substituted for an egg.

Convalescent Ulcer Diet:

Milk	Milk, cream.
Cheese	Cottage, cream; other mild, soft cheeses. Cheddar cheese may be added later.
Fats	Butter or margarine.
Eggs	Soft cooked, poached, scrambled in double boiler.
Meats, fish, fowl	Scraped beef patty; minced creamed chicken or fish.
Soups	Cream soups only, using the vegetables listed below.
Breads, cereals, Italian pastes	Enriched white bread, toasted or plain; refined cereals; all ready-to-eat cereals except those containing bran; strained oatmeal; plain white crackers; macaroni, spaghetti, noodles.
Vegetables	Puréed spinach, corn, peas, beets, carrots, squash, string beans, tomato; mashed or baked potatoes (without skin). Whole vegetables of low fiber content may be substituted gradually for puréed vegetables.
Fruits	Applesauce, baked apples without skin, ripe or baked bananas, diluted fruit juices, stewed or canned pears, peaches and peeled apricots, purée of all dried fruits except figs. It is advisable to take citrus fruit juices after eating some of the other foods of the meal, or to dilute them half and half with water.
Desserts	Ice cream, plain; custard; simple puddings of rice, cornstarch, tapioca or bread without fruit or nuts; gelatin desserts (with fruit as permitted above); sponge and other plain cakes, sugar cookies.
Beverages	Milk, cream, buttermilk.
Condiments	Small amounts of sugar and salt.

Foods to Be Avoided:

Fats	All fried foods.
Meats and fish	Smoked and preserved meats and fish; pork; meat gravies.
Soups	All meat soups.
Vegetables	All raw vegetables; all gas-forming vegetables, including cabbage, cauliflower, Brussels sprouts, broccoli, cucumbers, onions, turnips, radishes.
Fruits	All raw fruits except orange juice and ripe banana.

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Vegetables	Puréed spinach, corn, peas, beets, carrots, squash, string beans, tomato; mashed or baked potatoes (without skin). Whole vegetables of low fiber content may be substituted gradually for puréed vegetables.
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Foods to Be Avoided:

Fats	All fried foods.
Meats and fish	Smoked and preserved meats and fish; pork; meat gravies.
Soups	All meat soups.
Vegetables	All raw vegetables; all gas-forming vegetables, including cabbage, cauliflower, Brussels sprouts, broccoli, cucumbers, onions, turnips, radishes.
Fruits	All raw fruits except orange juice and ripe banana.

Desserts	Pastries, nuts, raisins, currants and candies.
Beverages	Coffee, tea, alcoholic and carbonated beverages.
Condiments	All condiments except salt.

MENU FOR SIX-FEEDING CONVALESCENT PEPTIC ULCER DIET

Breakfast	*Dinner*	*Supper*
Applesauce Egg (1), soft cooked White toast Butter or margarine Milk	Chicken Baked potato String beans purée White bread Butter or margarine Milk	Cream of spinach soup Cottage cheese White bread toast Butter or margarine Milk
10 A.M.	*3 P.M.*	*9 P.M.*
Strained oatmeal with milk Milk	Canned peaches White bread toast, buttered, one slice Milk	Gelatin dessert with whipped cream Milk

Maintenance Ulcer Diet. This is the diet the ulcer patient should follow more or less the remainder of his life. Besides the foods listed on the convalescent ulcer diet, he may include whole grain cereals; tender meats, fish and chicken, boiled, broiled or roasted; meat soups and gravies; raw fruits and vegetables in moderation; coffee, tea and cocoa and a moderate use of condiments.

Adequacy. The diet during the early stages of peptic ulcer is grossly inadequate for nutritional needs, and may have to be supplemented with vitamin C, the B vitamins and iron. Vitamin C especially is necessary to promote wound healing. Beginning with the convalescent ulcer regime, the diet can be made to meet all nutritional requirements if some care in the choice of foods is exercised.

BLEEDING ULCERS

Physicians are divided somewhat as to how best to treat a bleeding ulcer. Formerly food was withheld for from 24 to 72 hours after bleeding ceased. Now many believe that food should be given during this period in order to absorb the gastric juice which delays the healing of the ulcer. Kantor[5] says that if the patient has nausea or vomiting, heartburn or hiccough, it is not practical to give food within the first 24 to 48 hours. If, however, the patient has no gastric distress and is hungry, feeding may be begun at once. This may be a Sippy regimen, or a modification of it; or it may be one of several diets designed especially for this condition.

Andreson's regimen[6] for bleeding peptic ulcer consists of a mixture of gelatin, glucose, milk and cream, given frequently. Orange juice and water may be substituted for the milk and cream if the patient does

[5] Kantor, J. L., and Kasich, A. M.: Handbook of Digestive Diseases, St. Louis, Mosby, 1949.

[6] Andreson, Albert F. R.: Am. J. Digest. Dis. 6:641, 1939.

not tolerate the latter. As soon as possible the patient is placed on a convalescent peptic ulcer diet.

A very liberal diet for this condition came from Denmark some years ago, where Meulengracht[7] reported excellent results with it. By this treatment the patient is fed from the very onset of the hemorrhage what is termed a "full purée" supplemented by doses of iron and alkalis, although alkalis are not considered necessary or desirable by some physicians. The purée diet may be given as follows:

6 A.M.—Tea, white bread and butter
9 A.M.—Oatmeal with milk, white bread and butter
1 P.M.—Dinner (see below)
3 P.M.—Cocoa
6 P.M.—White bread and butter, sliced meats, cheese and tea

The dinner may include such foods as soup, creamed and puréed; minced and broiled meats, including liver, and poultry; broiled, baked or creamed fish; plain cooked eggs; mashed potatoes, puréed vegetables and fruits; custard, plain ice cream and puddings—rice, cornstarch, tapioca and gelatin. White bread, crackers, butter and milk beverages are also included.

Whatever method of treatment is used, the patient must understand that ulcers heal slowly, that they often recur, and that he should be very cautious about discontinuing the prescribed diet. It may be necessary to continue the diet, with some modifications, for months and sometimes years.

[7] Meulengracht, E.: The Lancet **229**: 1220, 1935.

STUDY QUESTIONS

1. What are some of the possible causes of gastric and duodenal ulcers?

2. Of what does the patient with peptic ulcer usually complain?

3. Why is alkali given to patients with ulcers?

4. Why are milk and cream effective foods to counteract the hyperchlorhydria in peptic ulcer?

5. A patient has been diagnosed as having a peptic ulcer and has been placed on a convalescent ulcer diet. What explanation should be given him so that he may grasp the necessity for following his diet? What specific foods should he avoid?

6. A patient on a convalescent ulcer diet works from 8:00 A.M. to 5:30 P.M. and must buy his lunch. What suggestions can you make to enable him to follow his diet while at work?

7. Using Chapter 11 as a guide, write a convalescent ulcer diet for a Jewish patient who carries his lunch to work; for a Puerto Rican elevator operator who works from 4 P.M. to midnight.

8. What are the foods allowed on the Meulengracht diet? On the Andreson regimen? What are the principles underlying the use of food in bleeding gastric ulcer?

Diseases of the Intestines

DIARRHEA
COLITIS
SPRUE
CONSTIPATION
CANCER OF THE BOWEL AND COLOSTOMY
DIVERTICULOSIS AND DIVERTICULITIS
HEMORRHOIDS

DIARRHEA

Diarrhea is characterized by an abnormally rapid passage of food along the alimentary tract, preventing complete digestion and absorption. The total quantity and the water content of the feces are increased, and frequently there is undigested food in the stools. The stools are semifluid and increased in number.

Causes of Diarrhea. Diarrhea may occur as an acute though short-lived manifestation, lasting 1 to 3 days, followed by complete recovery; or it may be the symptom of more serious disease. In the former case it may be due to food poisoning by the staphylococcus organism, to dietary indiscretion or some cause of unknown origin. When diarrhea lasts more than a few days, or recurs after seeming recovery, the cause should be investigated thoroughly. Infections of the intestinal tract such as typhoid fever, bacillary or amebic dysentery or trichinosis may be the underlying cause of the diarrhea; there may be organic disease such as colitis or sprue; or it may be one of the symptoms of the deficiency disease pellagra.

Diet in Diarrhea

In an acute attack of diarrhea, food and fluids by mouth should be withheld for the first 24 hours. Tea, toast and broth are usually well tolerated at the end of this time, and the patient is soon ready for a soft and then a regular diet. (See Chap. 17.)

In diarrhea of longer duration, such as is found in dysenteries, the diet should be low in residue and may have to be high in calories, if there has been weight loss. Whole-grain bread and cereals and raw vegetables and fruits, except bananas and fruit juices, are omitted. Calories can be added most easily by high caloric beverages (see Chap. 50 for recipes). For the remainder of the dietary regimen see the chart on page 330.

COLITIS

Colitis is an inflammatory disease of the colon. It is characterized by friability and hyperemia of the mucosa, leading to many small areas of bleeding ulceration. This may involve only a part of the rectum or colon, but in advanced stages of the disease usually involves the entire

area of the large bowel. The stools, which may be as frequent as 15 to 20 a day, are semiliquid and contain blood and mucus. The patient suffers not only from the discomfort of the frequent stools, which may be accompanied by cramps, but usually is malnourished and often to an extreme degree. Anemia may be present due to blood loss, and the patient may be underweight. The disease is usually treated conservatively by medical means, but in advanced cases surgery may be resorted to, and a colostomy performed. See page 330 for the diet in the latter case.

The etiology of colitis is unknown. No organism has been isolated as a cause of the disease. There are indications that colitis may occur on an emotional basis, since these patients are often very painstaking and meticulous and seem to have more than an ordinary dependence on others.

Dietary Treatment

High Protein. The diet should be high in protein to rebuild lost tissue. Tender meats, with little connective tissue, fish and chicken should be included twice a day. Eggs usually are well tolerated, and two or three cooked in desserts or as eggnogs may be given each day. Milk and cheese may or may not be tolerated. If ordinary fluid milk causes discomfort, boiled or evaporated milk sometimes can be substituted with good effect. High protein beverages should be given if the patient does not eat enough protein in his regular meals (see Chap. 50 for recipes). An inexpensive source of additional protein in the diet is dry skim milk powder, which may be added to fluid milk beverages or to other foods such as creamed dishes, mashed potatoes or desserts (see Chap. 49 for recipes).

High Caloric. Due to the loss of food substances in the stools and the patient's often capricious appetite, weight loss is a frequent symptom of colitis. Calories may be increased in the diet by increasing the use of bread and cereals, simple desserts, jellies and added butter and cream if the patient tolerates them. The high protein beverages mentioned in the previous paragraph may be made high caloric by the addition of lactose and chocolate or other fountain syrup.

Low Roughage. Foods high in cellulose should be avoided, as they tend to irritate the already inflamed and bleeding mucosa of the colon. Only refined breads and cereals, preferably enriched, should be served. Raw vegetables and fruits, with the exception of well-ripened bananas, should be omitted. In severe cases vegetables and fruits may have to be strained or omitted altogether. In that case one or two small glasses of fruit or vegetable juices may help to keep the diet palatable and nutritionally adequate. Gas-forming vegetables such as the cabbage family, turnips, onions and dried peas and beans should always be avoided. See page 330 for a variety of diets restricted in residue.

Progress. Patients with colitis are fussy about their food and often extremely hard to please. They have the irritability of the badly nourished patient and need much understanding and encouragement. Cecil[1] concludes the description of the disease

[1] Cecil, R. L., and Loeb, R. F.: Textbook of Medicine, ed. 8, Philadelphia, Saunders, 1951.

Diets Varying in Residue

Foods	Soft Diet	Moderately Low Residue Diet	Very Low Residue Diet
Milk	Milk, buttermilk, cream	Same	Same. Boiled or evaporated milk may be better tolerated than pasteurized milk
Cheese	Cottage, cream, cheddar	Same	Cottage, cream only, if tolerated
Fat	Butter, margarine	Same	Same
Eggs	Cooked, poached, scrambled in double boiler	Same	Same
Meat, fish, fowl	Tender chicken, fish, sweetbreads; ground beef and lamb	Same	Scraped beef; minced chicken and fish
Soups and broths	Broth, strained cream soups	Same	Broth only
Bread, cereals, Italian pastes	Whole grain or enriched bread and cereals; macaroni, spaghetti, noodles, crackers	Refined, enriched bread and cereals only; macaroni, spaghetti, noodles, white crackers	As in moderately low residue
Vegetables	Cooked vegetables: asparagus, peas, string beans, spinach, carrots, beets, squash; potatoes, boiled, mashed, creamed, scalloped, baked	Vegetable juice; vegetable puree; cooked asparagus tips, carrots; potatoes as for soft diet	Unseasoned vegetable juices in limited amounts
Fruits	Fruit juices, cooked and canned fruits (without skins, seeds or fiber); bananas	Fruit juice; fruit puree; ripe bananas; cooked, peeled apples, apricots, peaches, pears, plums	Fruit juices, preferably citrus, in limited amounts
Desserts	Ices, ice cream, junket, cereal puddings, custard, gelatin, plain cake and cookies; all without fruit and nuts	Same	Same
Beverages	Tea, coffee, cocoa; milk and milk beverages; carbonated beverages	Same	Tea, Postum; coffee as permitted; milk and milk beverages if tolerated
Condiments	Salt, moderate amounts of pepper; other mild spices; sugar	Salt and sugar only	Salt in small amounts; sugar

with the remark: "Few diseases require as much patience and perseverance." Fortunately patients often recover spontaneously, at least for a time, and can return to a more or less normal diet.

SPRUE

Sprue, known also as idiopathic steatorrhea, formerly was thought to be a tropical or subtropical disease, but it now is seen frequently in the temperate zone. The etiology is uncertain. By some it is thought to be a gastro-intestinal infection; by others, a deficiency disease; by still others, a disorder of absorption in the small intestine. Adlersberg[2] says: "Sprue is considered to be a syndrome and not a disease. The impaired intestinal absorption of fat, fat-soluble vitamins, some carbohydrates, especially polysaccharides, as well as other essential nutritional factors, is the central point of this disorder in association with various manifestations of nutritional deficiency."

Characteristics. The sprue syndrome is characterized by diarrhea, with the passing of at least 2 or 3 stools daily. These are described as being bulky, foamy, light colored and very foul smelling. They contain a high percentage of fatty acids and soaps, resulting from the incomplete absorption of the fats. For this reason the term steatorrhea is often applied to this and similar diseases such as celiac disease (see Chap. 33). The tongue and the mouth are often so sore that eating is difficult, indicating a deficiency of the B vitamins. Anemia is also a common symptom, and in the later stages osteomalacia may occur.

Dietary Treatment

The dietary treatment of sprue is similar to that for celiac disease. Protein becomes the chief nutrient of the diet because fats and starches are poorly assimilated. Tender lean meats, fish and chicken, egg white, skimmed milk and cottage cheese become the mainstay of the diet. Because carbohydrates, particularly starches, are not well absorbed, only fruits and the low starch vegetables are permitted. "Some raw vegetables, such as lettuce, tomatoes, endive, and other greens may be served, and even small quantities of radishes and cucumber. Of the cooked vegetables, asparagus, stewed tomatoes, broccoli, cauliflower, spinach, Swiss chard, summer squash and string beans may be used. Protein can be added in the form of specially prepared sauces and salad dressings, grated cheese or grated hard boiled egg white. Some frozen and molded salads can also be prepared with cottage cheese and gelatin."[3] Bananas are well tolerated, as in celiac disease, and are given freely. Other ripe or canned fruits and fruit juices, free from skins or seeds, may be included. Melba toast is permitted in small quantities because much of the starch has been dextrinized. No butter or margarine should be served in the early stages of the diet. Salad oils, fried foods, pastries, nuts and other foods containing a considerable amount of fat must be omitted.

To combat the anemia and glos-

[2] Adlersberg, D., and Rabinowitz, D.: J. Am. Dietet. A. **26**:879, 1950.

[3] *Ibid.*

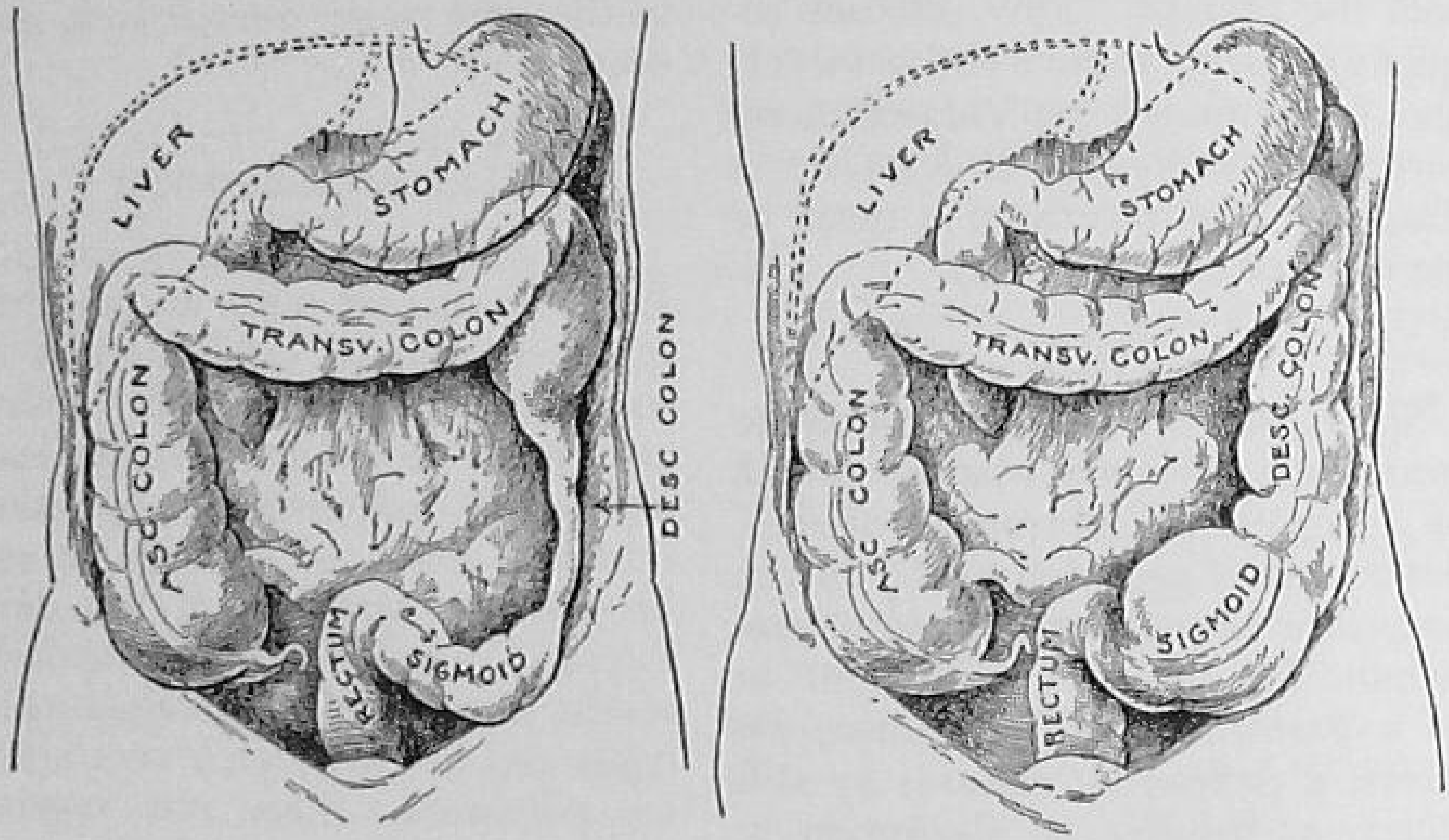


FIG. 66. (*Left*) Spastic constipation. Showing great constriction in the descending colon. Compare the colon in atonic constipation. (*Right*) Atonic constipation. Note the abnormal distention in the descending colon owing to its relaxed, atonic condition.

sitis, liver extract, folic acid and vitamin B_{12} have been found effective. The B complex vitamins should also be given. Calcium compounds and vitamin D (water miscible) are prescribed to prevent changes in the bony structure due to calcium losses. In some cases vitamin K is indicated, but in sprue this must be administered parenterally, as it cannot be absorbed when given in the usual fatty medium by mouth.

For reasons not now understood, the sprue found in tropical and semitropical climates responds well to this treatment, and sprue therefore has been thought to be a deficiency disease in these areas. However, a type of sprue found in the temperate zone, which may or may not have been acquired in tropical areas, is refractory to treatment and is sometimes called nontropical sprue. In such cases the patient must continue on the diet and the medications the rest of his life.

CONSTIPATION

A common disturbance of the digestive tract is constipation. However, there is considerable confusion as to what is meant by this term. Although a daily bowel movement has been stressed as desirable by health experts, there are many people for whom an evacuation every other day or even every third day is normal. Moreover, evacuation may occur regularly until a temporary strain occurs, in which case there may either be an increased number of bowel movements, almost a diarrhea; or there may be retention of the feces for a day or two, resembling constipation. The matter usually straightens itself out when the

strain is relieved. However, if the person becomes anxious when no daily bowel movement occurs, and begins to resort to cathartics or enemas, a vicious pattern is set up, and it may be difficult to effect a return to normal habits.

When there is no regularity of any kind in evacuation, it is well to inquire into the patient's dietary and living habits. Insufficient rest, inadequate, irregular or hurried meals, a food intake which does not meet the nutritional requirements of the body, will all tend to poor bowel function. The problem here is to help the patient accept a more regular mode of living, including a diet that meets all his nutritive requirements.

In some cases of constipation, actual changes in the bowel have occurred. One such type of constipation, called atonic, has, as its name implies, decreased tone of the musculature of the bowel, and therefore enlargement of part or all of it. In the spastic type of constipation, there is increased tonicity, with a corresponding narrowing of part of the bowel. Bowel movements in the latter case may vary from a diarrhea to constipation.

Dietary Treatment

In most cases of so-called constipation, a normal diet (see Chap. 10) containing roughage in the form of fresh and cooked fruit and vegetables and including whole grain bread and cereals will provide sufficient bulk to maintain regular bowel evacuation. Where such regularity needs to be re-established, for instance following an illness in which the mobility of the patient has been greatly limited, the addition of stewed fruit and stewed fruit juices to the ordinary diet will be found helpful.

In atonic constipation it may be necessary to increase the bulk by the inclusion of a salad both at lunch and at dinner, and by an increased use of fresh fruits. Bran cereal may be of help, but occasionally a bran bolus is formed which actually obstructs the bowel.

Conversely, if the patient has spastic constipation, the diet should contain only soft residue until healing and the release of spasm has taken place (see page 330). Only refined bread and cereals, and cooked fruits and vegetables should be served. This type of patient may benefit particularly from the addition to the diet of stewed fruit and fruit juices.

In all cases of constipation some supplementary source of the B complex vitamins may help to restore normal muscle tone and motility.

CANCER OF THE BOWEL AND COLOSTOMY

In all cases of constipation, or of constipation alternating with diarrhea, particularly if these symptoms are of short duration and in the face of otherwise normal living habits, there is the possibility of neoplastic growth of some section of the colon or of the rectum. If this diagnosis is established by the use of proctoscopic and x-ray examinations, the patient is subjected to surgery. If the cancer is in the upper part of the colon, the bowel may be resected and the ends brought together and sutured. If the cancer is in the sigmoid section of the colon or in the

rectum, a colostomy is usually performed. The cancerous segment of the bowel is closed off and resected. The proximal part of the colon is brought out upon the abdominal wall. This colostomy bud now becomes the permanent opening through which the bowel will discharge the feces.

Dietary Treatment

If an anastomosis of the bowel segments has been done, the postoperative dietary regime is little different from the usual one, except that it may progress more slowly. Nothing is given by mouth for several days, and then a clear liquid diet may be prescribed, again for several days. This is followed by a full liquid diet. If healing is satisfactory, the patient is placed on a soft (see Chap. 17) or a low residue diet (see page 330). Eventually he may return to a regular diet.

If a colostomy has been performed, the patient is given nothing by mouth, followed by clear fluids, until healing of the colostomy bud is well established. The patient is then advanced to a full liquid diet, and if this is well tolerated, to a moderately low residue diet (see page 330). Many patients with colostomies are able to return to their regular food habits, provided these are adequate for their nutritional needs, and that they omit foods which caused discomfort before they were ill. Dericks[4] states: "For most patients there seemed to be a direct relationship between the taking of of a regular diet and the establishment of bowel regularity. Actually there seemed to be no reason why the colostomy patient could not take solid foods just as soon as his general postoperative condition and wound permitted. Best results were achieved on a regular diet, with the elimination of those foods which caused the patient to have diarrhea, gas formation or constipation. Some patients could not tolerate onions, some baked beans, others stewed fruits. But this was on an entirely individual basis and varied with each patient."

[4] Dericks, V. C., and Robeson, K. A.: Pub. Health Nursing 41:16, 1949.

DIVERTICULOSIS AND DIVERTICULITIS

Diverticula, or small pouches, sometimes appear at weak points along the walls of the intestines. They may occur in the small intestine but are much more frequently seen in the colon. There may be few or many. The condition is known as diverticulosis and may or may not be a source of trouble.

However, when one or more of the pouches become infected or irritated, the condition is known as diverticulitis. The infection may be due to an accumulation of feces in the pouches, and may result in ulceration and perforation. In the latter case surgery is indicated.

In diverticulitis without perforation, but with pain, tenderness and sometimes fever, the treatment is much the same as for appendicitis, i.e., complete abstinence from food for from 24 to 48 hours, with only sips of water or cracked ice. Gradually, liquid foods are added, then a soft diet, followed by a bland diet (see page 317). When diverticulosis

has been diagnosed, even though without acute symptoms, the patient should be put on a bland, low-residue diet such as is found on page 330.

HEMORRHOIDS

Hemorrhoids are varicose veins around the anal sphincter. They may be internal or external. Some of the causes of the condition are childbearing, constipation and the long-continued use of cathartics and enemas. The symptoms are bleeding, itching and pain. The purpose of the treatment is to restore normal function of the intestinal tract. A bland diet, high in nonirritating forms of bulk or fiber, such as puréed fruits and vegetables, is given in addition to local treatment. Surgery is used in severe cases.

STUDY QUESTIONS

1. Plan a high-caloric, low-residue diet for a patient suffering from amebic dysentery.
2. Why must the patient with colitis have a low-residue diet? What problems is the nurse likely to encounter in regard to the colitis patient's food habits? Can such a diet meet all the patient's nutritional requirements?
3. Give the underlying principles for the high-protein, low-starch, low-fat diet in sprue. Write a menu for a day for a sprue patient living at home; for one who has to carry his lunch. What treatment besides the diet is usually ordered for the sprue patient? Why?
4. What additions to the diet will help many patients who have a tendency to constipation? In what type of constipation may the addition of extra roughage be inadvisable?
5. Write a menu for a day for a patient who has had a colostomy. He is on a general diet, but cannot tolerate gas-forming vegetables.

CHAPTER TWENTY-FIVE

Diseases of the Liver and the Biliary Tract

FUNCTIONS OF THE LIVER AND THE GALLBLADDER
PRODUCTION AND ROLE OF BILE
METABOLISM AND STORAGE
DETOXIFICATION
PATHOLOGIC CONDITIONS
JAUNDICE
DISEASES OF THE LIVER
INFECTIOUS HEPATITIS
CIRRHOSIS
DIETARY TREATMENT
DISEASE OF THE GALLBLADDER
DIETARY TREATMENT
FAT CONTENT OF FOODSTUFFS

FUNCTIONS OF THE LIVER AND THE GALLBLADDER

The liver is not only the largest glandular organ of the body, but one of the most important because of the diversity of functions which it performs, yet it is known as the "silent" organ because its owner is seldom aware of its presence or its functioning. It may well be compared with a modern industrial plant, performing within its confines processes of manufacturing, storing, routing and distributing and, finally, disposal of several types of waste products.

Production and Role of Bile

One of the functions of the liver is the production of bile, which plays an important part in the digestion and the absorption of fats. Bile, after its manufacture in the liver, is collected by many small bile ducts and emptied into the hepatic duct, which carries it away from the liver. The hepatic duct leads to the cystic duct and to the gallbladder. In the gallbladder the bile is concentrated by the absorption of water and also stored. When in the course of digestion fat arrives in the duodenum, it stimulates the production of a hormone, cholecystokinin, in certain cells of the duodenum. The hormone is carried by the blood stream to the gallbladder, causing it to contract. The bile re-enters the cystic duct and is forced down the common duct into the intestine. (See Fig. 67.) The pancreatic duct joins the common duct just before this point.

Bile is composed of bile salts, bile pigments, cholesterol, inorganic salts and water. Approximately 1-1½ quarts are produced daily.

With the aid of peristalsis and segmentation bile emulsifies the fat in the intestinal tract by breaking up the larger globules into many smaller ones. This creates a greater

surface area for the digestive enzymes to act upon.

The bile salts aid in "ferrying" the fatty acids across the intestinal wall during absorption. In diseases in which the amount of bile in the intestinal tract is diminished, we find interference with the absorption of fats and also with some of the fat-soluble vitamins.

The bile pigments are breakdown products of hemoglobin and have no known role. They give the characteristic green-brown color to the feces. When bile is absent from the intestinal tract, so-called clay-colored stools result.

The function of the other constituents of bile also are not known. They may be waste products.

Metabolism and Storage

Another important function of the liver is its role in the metabolism of food. The liver stores some of the carbohydrate derived from the diet as glycogen and breaks it down to glucose as necessary in order to maintain the normal blood sugar level of from 70 to 100 mg. per 100 cc. of blood.

With the aid of choline, derived from the amino acid methionine, fats are converted to lecithin in the liver. This seems to be an essential process in order that fats may be transported to the tissues in the body. When this conversion does not occur because of disease, fat stasis in the liver results, which may be a serious condition.

The liver controls the distribution of the amino acids to the tissues, where they are used for growth and tissue repair. It synthesizes some of the amino acids absorbed from the

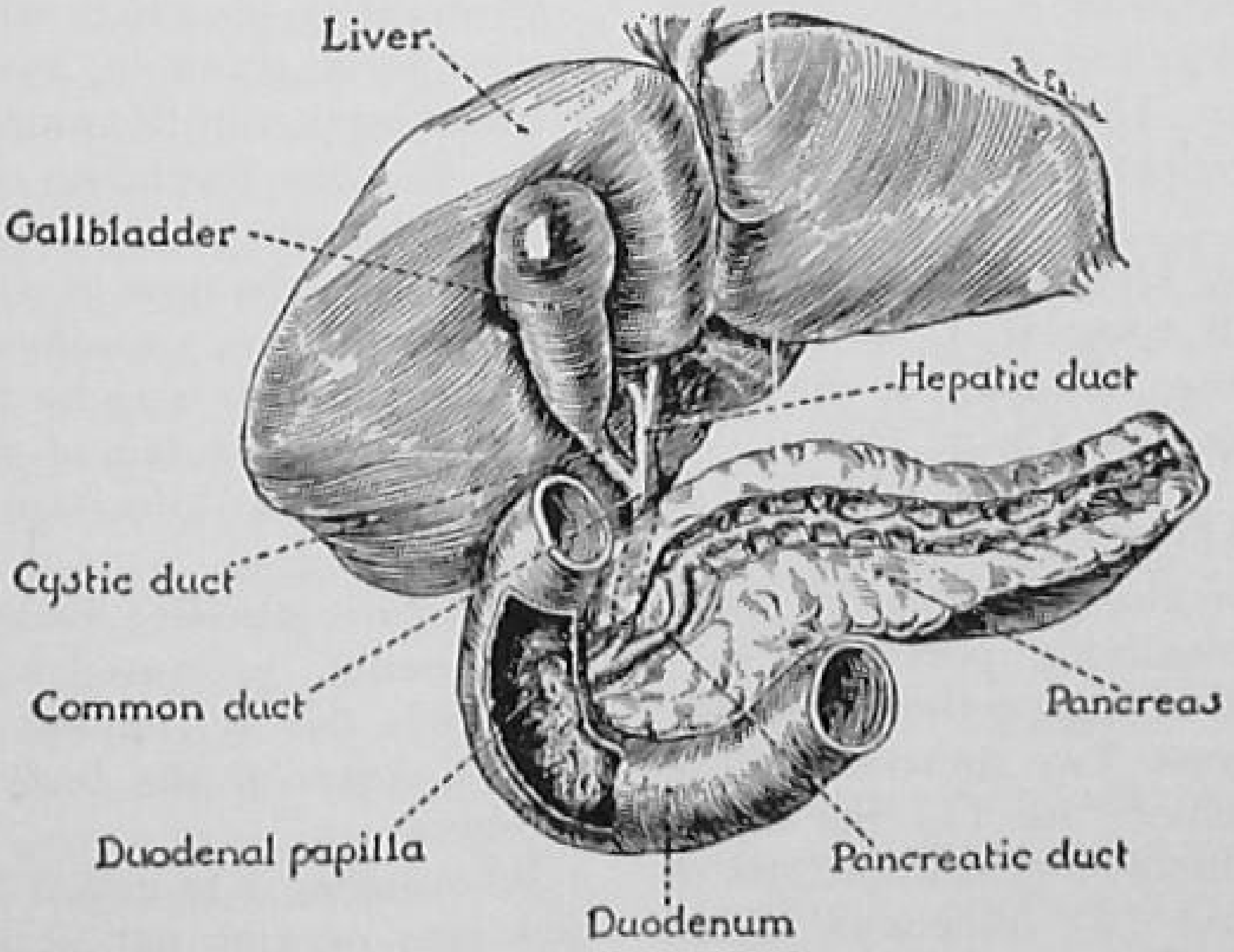


Fig. 67. The hepatic duct from the liver unites with the cystic duct from the gallbladder, forming a common bile duct opening into the small intestine. (Greisheimer: Physiology and Anatomy, Philadelphia, Lippincott)

digestive tract into the plasma proteins, albumen, fibrinogen, prothrombin and possibly globulin. Excess amino acids are split into the nitrogenous portion which forms the waste product urea, while the remainder of the molecule is used as carbohydrate (58 per cent) or fat (42 per cent).

A very important function of the liver is the role it plays in the metabolism and the storage of iron and copper, as this organ is the chief storehouse from which they are distributed for use in the hemoglobin of the red cells of the blood. The liver also supplies the antianemic factor which is concerned with the development of the red blood cells in the bone marrow. (See Chap. 29.)

Recent data have shown that approximately 95 per cent of the vitamin A stored in the body is found in the liver. The conversion of carotene into vitamin A takes place in the liver. Vitamin D is also stored in the liver. The livers of fish are especially rich as storehouses of these vitamins.

It is now known that other vitamins—the B complex, C, E and, to some degree, vitamin K—are also stored there (see Chap. 7).

Detoxification

The liver also performs the function of detoxifying poisonous substances and changing them into less harmful forms. Two sources of these toxic substances are (1) the digestive tract, foods, ingested bacteria or poisons; and (2) infections within the body tissues. Here the liver, like the spleen, acts as a bactericidal agent by destroying bacteria that enter through the circulation. By chemical action, it also can convert harmful substances into nontoxic materials.

PATHOLOGIC CONDITIONS

It is not surprising that an organ which performs so many functions as the liver should manifest many and far-reaching symptoms when it is diseased. Fortunately, the liver, if given proper care and treatment, has remarkable reserve power for regeneration and repair.

Jaundice

Jaundice is a symptom of a number of diseases of the liver and the biliary tract. It may be obstructive, toxic or hemolytic. Jaundice is recognized as a yellow pigmentation of the body tissues due to the presence in the blood of more than the normal amount of bile pigments.

Obstructive jaundice, which is by far the most common, may be due to inflammation in the mucosa of the ducts, to stone formation or to pressure by tumors or adhesions. These obstruct the bile flow at some point, either partially or completely.

Toxic jaundice may be caused by poisons, drugs, toxemia of pregnancy, or a virus, as in infectious hepatitis (see next page).

Hemolytic jaundice, which is much less common, is caused by diseases in which the red blood cells are broken down in the body in large numbers.

Biliousness. A so-called bilious attack may or may not be related to a diseased liver. It is caused more frequently by overeating, the unwise selection of foods or constipation, although it is known that digestive dis-

turbances are among the more common symptoms of diseases of the liver and the biliary tract.

DISEASES OF THE LIVER

Two of the principal diseases of the liver in which dietary treatment plays an important role are infectious hepatitis and cirrhosis.

Infectious Hepatitis

Etiology and Symptoms. Hepatitis is a general term which may be used to include injury to the liver cells themselves as a result of bacterial or virus infections, toxins and drugs. The most important example of hepatitis is catarrhal jaundice, also called infectious hepatitis or epidemic jaundice. This disease was one of the chief causes of illness among our armed forces of World Wars I and II. It is also prevalent among civilians to some extent. It may be acquired by direct transmission of the virus or by transfusion of blood from a donor who has had infectious hepatitis. In the latter case the disease is usually called homologous serum jaundice.

Acute infectious hepatitis is characterized by elevation of temperature, headache, abdominal discomfort and loss of appetite. After a short period, lasting from a few days to 2 or 3 weeks, jaundice may appear. Usually from 6 to 8 weeks are required for recovery. If sufficient time for rest and treatment is not provided a chronic condition such as cirrhosis may be the final outcome, this being the experience of some of our soldiers in the Mediterranean theater of war during World War II.

Dietary Treatment

In the acute stage of infectious hepatitis it may not be possible for the patient to consume much food because of pain and nausea, and intravenous food and fluids have to be substituted. As soon as possible the patient should be placed on a high-protein, high-caloric diet.

The high protein is essential for the regeneration of the liver tissue. It will also help to prevent fat stasis in the liver by providing protein for the conversion of fat to lecithin, which removes it from the liver. Barker et al.[1] report having given with success 250 Gm. protein to soldiers in the Mediterranean theater of war. The quantity given at present is usually between 100 and 150 Gm.

The high carbohydrate, indicated in the high-caloric diet, seems to have a protective effect on the liver and promotes healing.

Moderate fat. It used to be thought that the diet had to be low in fat in order to prevent deposit in the liver, but as long as enough protein is ingested, there seems to be no necessity to limit the fat. Its presence in the diet adds to its palatability and increases the total food intake. For the foods allowed or limited, and for menus for the above regimen, see those listed under cirrhosis.

Cirrhosis

Etiology. Cirrhosis is the final stage of liver injury. It may be due to chronic alcoholism, to diseases of the circulatory system, such as Banti's disease, or to chronic infec-

[1] Barker, M. H., Capps, R. B., and Allen, F. W.: J.A.M.A. 128:997, 1945.

HIGH-PROTEIN, HIGH-CARBOHYDRATE, MODERATE-FAT DIET

Semiliquid Form

MEALS	FOOD ITEMS	AMOUNT ALLOWED	PROTEIN	FAT	CARBOHYDRATE	CALORIES
		Gm.	Gm.	Gm.	Gm.	
Breakfast:	Orange juice with	1 cup 200	2	...	22	88
	Lactose	2 tablespoons 16	..	...	16	64
	Farina, cooked	⅔ cup 130	1	...	12	55
	Milk	½ cup 100	3.5	4	5	68
	Cream	½ cup 100	3	20	4	204
	Coffee	....	..	...	...	..
	Sugar	1 tablespoon 12	..	...	12	48
			9.5	24	71	527
10 A.M.:	High-protein milk	1 cup 200	23	6	36	290
Lunch:	Cream of asparagus soup	1 serving 100	3.5	6	9	100
	Eggs	Two 100	13	12	1	162
	Mashed potatoes	1 serving 100	2	6	16	123
	Pureed spinach	1 serving 100	3	1	4	26
	Milk	1 cup 200	7	8	10	136
	Pureed dried apricots	1 serving 50	2	...	33	131
			30.5	33	73	678
3 P.M.:	High-protein milk	1 cup 200	23	6	36	290
Supper:	Orange juice with	1 cup 200	2	...	22	88
	Lactose	2 tablespoons 16	..	...	16	64
	Farina, cooked	⅔ cup 130	1	...	12	55
	Milk	½ cup 100	3.5	4	5	68
	Cream, 20%	½ cup 100	3	20	4	204
	Sugar	1 tablespoon 12	..	...	12	48
	Baked custard	1 serving 100	5	5	11	114
			14.5	29	82	641
8 P.M.:	High-protein milk	1 cup 200	23	6	36	290
		Total	123.5	104	334	2,716

All calculations based on Table 1, Part Four.

To make this diet moderately low in sodium, cook all food without salt and substitute Protinal feedings (Chap. 50) or other low-sodium beverage in place of the high-protein milk feedings.

HIGH-PROTEIN, HIGH-CARBOHYDRATE, MODERATE-FAT DIET

Solid Diet

MEALS	FOOD ITEMS	AMOUNT ALLOWED	PROTEIN	FAT	CARBOHYDRATE	CALORIES
Breakfast:		Gm.	Gm.	Gm.	Gm.	
	Fruit, 15%[1]	½ cup 100	1	...	15	64
	Cereal, cooked	⅔ cup 130	1	...	12	55
	Eggs	2 100	13	12	1	162
	Toast	2 slices 46	4	2	24	126
	Butter or margarine	1 tablespoon 14	..	11	...	100
	Jam	1½ tablespoons 30	..	...	21	84
	Milk	½ cup 100	3.5	4	5	68
	Cream, 20%	½ cup 100	3	20	4	204
	Coffee	......	..	...	...	..
	Sugar	1 tablespoon 12	..	...	12	48
			25.5	49	94	911
10 A.M.:	Fruit juice with	1 cup 200	2	...	26	112
	Lactose	2 tablespoons 16	..	...	16	64
			2	...	42	176
Lunch:	Meat, fish or fowl[2]	Large serving 120	28	16	...	250
	Vegetable, 3%[1]	1 serving 100	2	...	3	20
	Vegetable, 9%[1]	1 serving 100	3	...	9	48
	Vegetable, 18%[1]	1 serving 100	3	...	18	84
	Bread	2 slices 46	4	2	24	126
	Butter or margarine	1 tablespoon 14	..	11	...	100
	Milk	1 cup 200	7	8	10	136
	Custard	1 serving 100	5	5	11	114
			52	42	75	878
3 P.M.:	Fruit juice with	1 cup 200	2	...	26	112
	Lactose	2 tablespoons 16	..	...	16	64
			2	...	42	176
Supper:	As for lunch	......	52	42	75	878
8 P.M.:	Fruit juice with	1 cup 200	2	...	26	112
	Lactose	2 tablespoons 16	..	...	16	64
			2	...	42	176
		Total	135.5	133	330	3,195

[1] It will be noted that the fruit and vegetables in this diet menu are chosen according to the classification based on Carbohydrate Content which appears in Table 4, Part Four.

[2] Calculation based on the composition of round steak, pork (lean), chicken and haddock as found in Table 1, Part Four.

[3] To make this diet low in sodium, cook all food without salt and limit eggs to one a day, meat to one 3-ounce serving (90 Gm.) and milk to 600 cc. daily. Substitute Protinal feeding (Chap. 50) or other low-sodium beverage for the between-meal feedings of fruit juice with lactose at 10, 3 and 8. To make the diet still lower in sodium, substitute Lonalac for all milk used,.

tious hepatitis discussed in the paragraphs above.

It is thought that in chronic alcoholism, cirrhosis is due to deficiencies in food intake occurring over a long period of time. The individual may get as much as from 1,500 to 2,500 calories daily from the alcohol he consumes, since one gram of alcohol yields 7 calories. There is little desire for other food, and gross inadequacies in all food constituents result. This leads to necrosis of liver tissue and its eventual replacement by scar tissue. If the diet is changed to supply the needed nutrients, regeneration of the less-damaged liver tissue may take place, or at least further degeneration will be prevented.

Symptoms. Besides jaundice and a marked enlargement of the liver, there may be a low level of serum proteins, and in the advanced cases, ascites and varices (varicose veins) of the esophagus. The diet must take into account some or all of these factors.

Dietary Treatment

High Protein. As in the diet for hepatitis, the increased protein in the diet will help to regenerate liver tissue and prevent fat stasis. It is also given in an attempt to increase the low serum proteins in the blood. Generous amounts of lean meat should be included in the diet as well as plenty of milk and eggs. It is sometimes difficult for the patient to consume the required amount of protein at his regular meals, in which case supplementary high protein feedings may be given.[2] (See Chap. 50 for recipes.)

High Carbohydrate. It was found experimentally in animals and has since been shown clinically in man that a high-carbohydrate diet is well tolerated in liver disease and seems to aid in recovery. A diet containing from 300 to 350 Gm. of carbohydrate is recommended. This should include breads and cereals, potatoes, nongaseous vegetables, fruits, fruit juices, which may be fortified with lactose, jams, jellies, honey, sugar and plain hard candies.

Moderate Fat. Experiments by Patek,[3] Hoagland[4] and their associates have shown that fat, which formerly was thought to be injurious in liver disease, may be consumed in reasonable amounts, from 100 to 150 Gm. or even more, without any deleterious effects. The fat was shown to make the diet more palatable, and in this way the patient was encouraged to eat more food and more calories, which is essential in this disease.

It should be pointed out, however, that the fats included in these experimental diets were mostly those from milk, cream, butter and eggs. No fried foods or rich pastries were allowed. Crisp bacon was given occasionally in small amounts to provide flavor. A table showing approximate fat content of principal foods is given on page 345.

High Vitamin. Because of poor absorption of fat-soluble vitamins due to insufficient bile in the intestinal tract, it may be necessary to increase these nutrients in the diet above the normal requirements. Moreover, thiamine has been shown

[2] Perry, M. E.: J. Am. Dietet. A. **22**: 110, 1946.

[3] Patek, A. J., and Post, J.: J. Clin. Investigation **20**:481, 1941.

[4] Hoagland, C. L., et al: Am. J. Pub. Health **36**:1287, 1946.

by some investigators to prevent fat deposit in the liver, so that additional vitamins of the B complex usually are prescribed. These usually are given in synthetic form.

Fluids and Salt. Where severe ascites and possibly general edema exist, it may be necessary to limit the fluid and salt intake. All foods must be cooked without salt. Because meat, milk and eggs have a high sodium content, there may have to be limitations of these foods, and high-protein, low-sodium beverages substituted to provide the protein so necessary in this diet. (See Chap. 50 for recipes.) Milk and fruit juices will have to be limited if the fluids are restricted.

Roughage. If esophageal varices are present and if the diet contains much roughage, these varices may bleed and further complicate the disease. Foods to be omitted are raw fruits and vegetables and whole-grain breads and cereals.

Alcohol is strictly prohibited.

One of the grave problems confronting the nurse is to persuade the patient with cirrhosis of the liver to eat, for his recovery rests almost entirely on his dietary intake. He often is toxic and may be extremely discouraged and depressed. The high protein, high carbohydrate, moderate fat semiliquid diet on page 340 may best meet his needs as first. Sometimes these patients will tolerate a high protein, high caloric beverage, given six times a day or even as frequently as every two hours, better than large meals at the usual hours. (A variety of such feedings will be found in Chapter 50.) The feedings should be supplemented with small trays at regular meal hours. It is gratifying to find that after two to four weeks of such a regimen, the patient is notably better, and may now relish a high-protein, high-caloric diet such as found on page 341.

High-Protein, High-Carbohydrate, Moderate-Fat Diet

Foods Allowed:

Milk	Milk, buttermilk—at least a quart a day; cream.
Cheese	All types unless salt is restricted.
Fats	Butter or margarine.
Eggs	Two or more a day; boiled, poached, scrambled in double boiler, eggnog.
Meat, fish, fowl	Two large servings a day of lean beef, veal, lamb, chicken, liver, nonfatty fish.
Soups	All varieties.
Bread, cereals, Italian pastes	Whole wheat or enriched white bread, rolls, crackers, cereals, macaroni, spaghetti, noodles. (Omit whole wheat products if low residue is desired.)
Vegetables	Raw or cooked tomatoes, carrots, peas, wax or string beans, spinach and other greens, asparagus, squash, beets, salad greens. (Omit raw vegetables if low residue is desired.) Boiled, baked or mashed potatoes.
Fruits	Fresh, canned or stewed; juices. (Omit raw fruits if low residue is desired.)

Desserts	Ice cream and sherbet; rice, tapioca, bread and cornstarch puddings; custard, junket, gelatin; plain cakes and cookies.
Beverages	Milk, tea, coffee, cocoa.
Sweets	Sugar, honey, jams, jellies in increased amounts.
Condiments	Salt as allowed.

Foods to Be Avoided:

Fats	All fried foods.
Meat, fish, fowl	All meats high in fat such as fat pork, goose and duck; fatty fish.
Vegetables	Gas-forming vegetables such as onions, turnips, cabbage, cucumbers, radishes.
Desserts	Pastries.
Beverages	All alcoholic beverages.
Condiments	Pepper, spices, horseradish, mustard, ketchup.

DISEASE OF THE GALLBLADDER

Disease of the gallbladder may be due either to infection or the presence of gallstones. In either case, there is a great deal of pain when fat is ingested. At the beginning of this chapter we discussed the mechanism by which the presence of fat in the duodenum stimulates the production of a hormone, cholecystokinin, which, when it is carried by the bloodstream to the gallbladder, causes it to contract and release bile.

It can be seen readily that a meal containing much fatty food may bring on an acute attack of gallbladder pain and distress in individuals suffering from inflammation of this organ, from the presence of gallstones, or both. Therefore, the diet should be low in fat. Since cooked fats are less well tolerated than uncooked fats, it is better to omit the former. Foods such as milk, eggs and butter should be allowed in limited quantities in order to meet the requirements of the adequate diet.

Restrictions and Omissions on a Low-Fat Diet

Foods Limited:

Milk to one pint daily.
Eggs to one daily.
Butter or margarine to half a tablespoon daily.

Foods Omitted:

Cream; cheese other than pot or cottage cheese.
All fried foods.
Salad oils.
All meat high in fat, such as pork, bacon, ham, goose, duck, fatty fish.
Pastry.
Nuts, olives, avocados.

The milk and the egg may be used as such in the diet, or they may be incorporated in cooked foods such as plain cake or custard.

The Diet Postoperatively. In the case of gallstones, most patients eventually are operated upon, and the gallbladder is removed. It is wise to continue the low-fat diet for some months following operation until all inflammation in the surrounding tissues has subsided. Cholecystokinin stimulates the bile ducts, as well as the gallbladder to contract, and pain from the operated area may still result on the ingestion of fat.

Other Considerations. Patients with gallbladder disease are often constipated and proverbially obese. For these reasons it is important that they exercise and eat regularly and avoid overeating.

Role of Cholesterol. Cholesterol is excreted normally in the bile and it often forms part or all of the constituents of gallstones found on operation. It has been thought that a diet low in cholesterol might be indicated. However, the cholesterol levels in the blood and the tissues seem to have little relationship to the cholesterol content of the food in-

Fat Content of Foodstuffs*

100–80%	80–60%	60–40%	40–30%
Butter Crisco, Spry and other hydrogenated fats Lard Margarine Olive oil Salad oils Salt pork Suet	Bacon, medium fat Pecans, walnuts	Bacon, lean Ham, fat Loin chops, fat Mutton, fat Peanuts, almonds Pork, fat Sausage, pork	Cheese, cheddar or cream Cream, heavy Eggs, yolk Mutton, medium fat Pork, medium fat Potato chips
30–20%	**20–10%**	**10–1%**	**1–0%**
Avocado, Fuerte Beef, medium fat Cream, light Ham, lean Lamb Olives, ripe Tongue, canned Turkey	Beef, round, sirloin, tongue Cake, fruit, plain Capon, chicken Crackers, plain Eggs Lamb, roast Mackerel Olives, green Salmon, Chinook or King	Bread Chicken, broilers Fish: bass, bluefish, cod, flounder, halibut, haddock, pickerel, salmon (other than Chinook or King) Milk, whole Organs: brain, heart, liver, kidney Puddings made with milk Veal, breast, leg, loin	Buttermilk Cereals Cheese, cottage Fruits Gelatin Macaroni, spaghetti Milk, skim Sugars Vegetables

*For convenience foods have been classified according to fat content as given in Table 1, Part Four.

take. For cholesterol content of food see Table 6, Part Four.

STUDY QUESTIONS

1. What are the functions of the liver as an organ of digestion? As an organ of metabolism? As an organ of storage?
2. What are some of the characteristic symptoms of disease of the liver?
3. A patient is diagnosed as having cirrhosis of the liver with ascites. The doctor orders a high-protein, high-carbohydrate, moderate-fat diet for him. Explain why such a diet has been ordered.
4. What foods are to be used in the above diet? What ones avoided?
5. How can this diet be changed to make it low in salt yet keep it high in protein?
6. Why does a patient with gallbladder disease have pain on the ingestion of fat? Why may this pain persist for several months postoperatively?
7. Even though fats are restricted in gallbladder disease, which ones are most easily tolerated and for what reasons?
8. Which foods should be avoided, which limited on a low-fat diet?
9. Write a low-fat general diet for a patient with gallbladder disease. Write a low-fat soft diet for the same patient three days after operation.
10. When a low-fat, low-cholesterol diet is ordered, what foods should be avoided?

CHAPTER TWENTY-SIX

Allergy: Skin Diseases

ALLERGY AND ITS MANIFESTATIONS
CLASSIFICATION OF ALLERGENS
FOODS AND ALLERGY
FACTORS AFFECTING ALLERGIC MANIFESTATIONS
TEST FOR ALLERGY
TEST DIETS
TREATMENT OF ALLERGY
DESENSITIZING TREATMENT
RESTRICTED-DIET TREATMENT
TEACHING THE PATIENT
SKIN DISEASES
VITAMIN DEFICIENCES
ACNE VULGARIS

ALLERGY AND ITS MANIFESTATIONS

Classification of Allergens

Allergy is a condition of hypersensitivity to certain substances which in the great majority of human beings produce no ill effect. This hypersensitivity may be caused in one individual by one substance and by an entirely different substance in another.

The offending items comprise a long list[1] and include:

- Inhalants such as pollen, dusts, and cosmetics.
- Ingestants such as foods and drugs.
- Contactants such as cosmetics, poison ivy and adhesive.
- Infectants such as bacteria, fungi and parasites.
- Insect and snake bites.
- Injectants such as serums, vaccines and hormones.
- Physical agents such as heat, cold, sunlight and effort.

[1] Rowe, A. H., *in* Wohl, M. G.: Dietotherapy, Chap. 33, Philadelphia, Saunders, 1945.

Authorities disagree as to the prevalence of allergy, but it is believed quite generally that approximately 10 per cent of the population show evidences of allergy to one or more substances during life.

Manifestations. There are no typical symptoms, as in a communicable disease, partly because very different tissues of the body respond. Among the many symptoms are eczema, often of extreme nature, urticaria (hives), asthma, also sometimes very severe, redness and swelling of the eyes, running of the nose (as in hayfever), headache or migraine, and such gastro-intestinal disturbances as diarrhea and colic. The fact that so many of the allergic attacks are related to the skin and the mucous-membrane regions is explained partly by the extensive surface areas exposed to contact with the irritating substances or allergens, either directly or by the circulating blood. Swelling or edema of the affected

organ or tissue is often an important factor in the symptoms; for example, in lips, eyes and nasal passages, and in the cerebral tissues in allergic headache or migraine. Smooth-muscle spasm is also important, as in allergic diarrhea; the action may be combined with edema, as in bronchial asthma.

This chapter is chiefly concerned with food allergies, but it should be borne in mind that any allergy, if severe, may interfere with the nutrition of the individual due to the effect on appetite and thus the general health. This is particularly true of children whose growth and development may be retarded seriously. In all cases the nutrients in the diet should be evaluated carefully, and every effort should be made to make the diet as nutritionally adequate and attractive as possible.

Foods and Allergy

Proteins are considered to be the most important factors in food allergy, even though foods which cause such allergic disturbances may vary widely in protein content. Sensitivity to a food such as honey is explained as due to the associated protein in the pollen grains mixed in the honey, for it has been shown that very minute amounts of a given protein may cause allergic reaction.

Criep[2] states that among the most common allergy-producing foods are milk, eggs and cereals. Next in order are fish, nuts, spices, vegetables and fruits. Important among vegetables are celery, string beans and Lima beans; and among fruits, bananas, oranges, strawberries and lemons. Over 70 different foods have been listed by various investigators as causes of allergic diseases or disturbances. Some of our most nutritious foods, such as wheat, milk, and eggs, are included in these lists.

[2] Criep, L. H.: Essentials of Allergy, Philadelphia, Lippincott, 1945.

Factors Affecting Allergic Manifestations

Whether or not an allergic disturbance follows the eating of a specific food depends in great part upon the individual's physical and often on his emotional state. The real cause is often hidden, because the patient can point to instances where the suspected foods were eaten without ill effects.

TESTS FOR ALLERGY

Skin Tests. Numerous tests for the detection of allergy and its specific causative agents have been used by the medical profession, among the first being the skin tests known as the scratch, the patch, and the intradermal. As the names would indicate, the solution containing the suspected offending substance is applied either to a scratched portion of the skin, or is applied to a certain patch of skin and then covered with cellophane for 2 to 4 days. By the intradermal test the solution is injected into the superficial layers of the skin.

In the event that welts, wheals and redness develop from any of these tests, an allergic reaction is indicated.

The case history, which should include a record of the diet, is important, and may suffice for accurate diagnosis.

A recent article in the *Journal of Allergy*[3] states that "the best diagnostic tool in allergy is a careful history of events, conditions, and other factors relating to the present illness. . . . If careful history taking reveals few or no clues of importance, then skin testing will probably serve as a short cut to the finding of the offending agent."

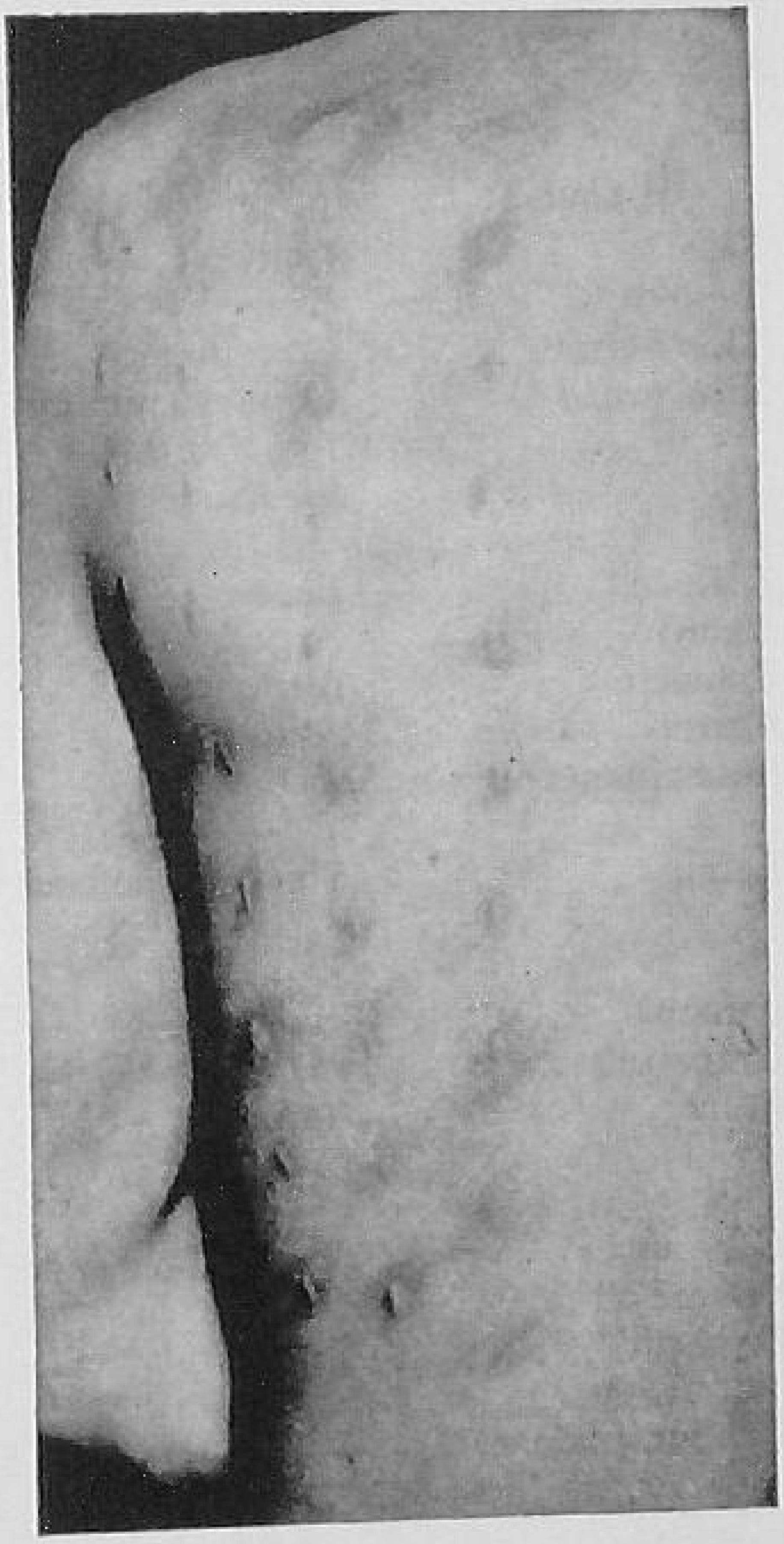


Fig. 68. The wheals or spots on the patient's back indicate a sensitivity to the extracts injected. (J. Warrick Thomas, M.D., Department of Allergy, Cleveland Clinic, Cleveland, O.)

Test Diets

Some allergists find that food allergy is somewhat more difficult to demonstrate by means of skin tests than other forms of allergy. Rowe[4] finds the trial or test diets more reliable. These diets are also called elimination diets, the idea being to put the patient on a test diet consisting of only a few foods which are known to be unlikely to produce allergic reactions.

Elimination Diets. Several elimination diets have been proposed to determine which food is causing the reaction. The patient is fed one or another of the basic elimination diets for a period of from 5 to 7 days. Unless the patient becomes symptom free, he is put on another of the diets for the same length of time. If at the end of the last test, relief has not been obtained, it is evident that other causes than food should be sought. If, on the other hand, the patient is relieved of his symptoms on any one of the elimination diets, he is kept on this one week. Other foods, first chosen from the related elimination diets and then from foods in general, are given, one by one, with wheat, eggs and milk last, because these three foods have been found to be the ones most likely to produce allergy. If the patient shows allergic symptoms after the addition of any one food, that food may be suspected as the cause of the allergic disturbance. Many people are allergic to certain vegetables and fruits. It has been found that members of

[3] Friedenwald, V. E.: J. Allergy **23**: 420, 1952.

[4] *Op. cit.*

Elimination Diets (Rowe)

Diet 1	*Diet* 2	*Diet* 3	*Diet* 4
Rice Tapioca Rice biscuit Rice bread	Corn Rye Corn pone Corn-rye muffins Rye bread Ry-Krisp	Tapioca White potato Breads made of any combination of soy, Lima, potato starch and tapioca flours	Milk† Tapioca Cane sugar
Lettuce Chard Spinach Carrot Sweet potato or yam	Beets Squash Asparagus Artichoke	Tomato Carrot Lima beans String beans Peas	
Lamb	Chicken (no hens) Bacon	Beef Bacon	
Lemon Grapefruit Pears	Pineapple Peach Apricot Prune	Lemon Grapefruit Peach Apricot	
Cane sugar Sesame oil Olive oil* Salt Gelatin, plain or flavored with lime or lemon Maple sirup or sirup made with cane sugar flavored with maple Royal baking powder Baking soda Cream of tartar Vanilla extract Lemon extract	Cane or beet sugar Mazola Sesame oil Salt Gelatin, plain or flavored with pineapple Karo corn sirup White vinegar Royal baking powder Baking soda Cream of tartar Vanilla extract	Cane sugar Sesame oil Soybean oil Gelatin, plain or flavored with lime or lemon Salt Maple sirup or sirup made with cane sugar flavored with maple Royal baking powder Baking soda Cream of tartar Vanilla extract Lemon extract	

* Allergy to it may occur with or without allergy to olive pollen. Mazola may be used if corn allergy is not present.

† Milk should be taken up to 2 or 3 quarts a day. Plain cottage cheese and cream may be used. Tapioca cooked with milk and milk sugar may be taken.

(Rowe, A. H.: Elimination Diets and the Patient's Allergies, ed. 2, Philadelphia, Lea, 1944)

Typical Menus Based on Diets 1 to 3

Diet No. 1

Breakfast	*Dinner*	*Supper*
Grapefruit	Lamb chops	Grapefruit juice
Boiled rice with maple sirup	Spinach with lemon	Lamb stew (lamb, carrots, rice)
Tea with lemon and sugar	Sweet potato	Rice bread or biscuits
	Rice bread or biscuit	Gelatin with lemon juice, sugar and pear
	Stewed pear with sugar	Tea with lemon and sugar
	Tea with lemon and sugar	

Diet No. 2

Breakfast	*Dinner*	*Supper*
Stewed prunes	Roast chicken	Sliced cold chicken
Fried corn-meal mush	Baked squash	Pickled beets
Bacon	Asparagus	Ry-Krisp
Tea with sugar	Corn pone	Stewed apricots with sugar
	Pineapple, canned	Tea with sugar
	Tea with sugar	

Diet No. 3

Breakfast	*Dinner*	*Supper*
Grapefruit	Roast beef	Bacon
Fried potatoes	Peas	Stewed Lima beans (seasoned with bacon fat)
Soybean muffins (without eggs)	Glazed carrots (with Wesson oil)	Potato flour muffins
Tea with lemon and sugar	Lima-bean bread	Peach tapioca
	Tea with lemon and sugar	Tea with lemon and sugar

the same botanical group have a similar effect, i.e., Brussels sprouts and cauliflower are likely to cause a reaction if cabbage does, because they are botanically related; likewise, lemons and grapefruit when oranges are allergenic. The basic elimination diets are composed of foods which are least liable to cause allergy.

The menus shown above are based on the elimination diets by Rowe:[5]

[5] Rowe, A. H.: Elimination Diets and the Patient's Allergies, ed. 2, Philadelphia, Lea, 1944.

TREATMENT OF ALLERGY

Once the causal foods have been identified by one or more of the preceding tests, three courses are open: (1) to desensitize the patient gradually to those foods or (2) to limit the patient to diets which do not include the irritating foods. A third method which has come into recent use for patients with very severe manifestations of allergy, such as intractable eczema or asthma, is the use of ACTH (adrenocorticotropic hormone) and cortisone. These

hormones do not cure but as long as the patient is kept on small maintenance doses the symptoms are greatly relieved.

Desensitizing Treatment

Avoidance of allergy-causing foods is not always desirable. It is difficult, for example, to supply children with the necessary food for growth if wheat or milk is eliminated from their diet. Unless the patient is severely allergic, it may be wise to try to desensitize him to such valuable but for him irritating foods. This treatment, however, should follow a period of complete abstinence from the offending food. Fortunately, it may be possible to desensitize by mouth; and, beginning with doses so minute that they cause no reactions in the person being treated, gradually the amount is increased until ordinary food portions can be tolerated.

To illustrate, one child sensitive to egg white was so desensitized through a period of 7 months by a dosage beginning with $\frac{1}{1{,}000}$ Gm. dry or powdered egg white. Another child could tolerate at first only such small amount of egg white as that present in a teaspoonful of a dilution made by adding one drop of egg white to a pint of water. In 3 months, however, he was able to include eggs in his diet.

Often adults may desensitize themselves successfully. A man acutely but periodically sensitive to milk so desensitizes himself every 3 or 4 years. After eliminating milk, he takes daily an increasing number of drops of cream, until he can resume the use of both cream and milk in his diet.

Restricted-Diet Treatment

The chief means of treating the food-sensitive patient is to restrict the diet to the foods to which the patient is not allergic, and the best means of accomplishing this is to teach the patient as explained later in the chapter.

When the food responsible for an allergic disturbance is an unusual article in the individual's diet, such as strawberries, he is likely to associate the attack with the related food and is able, therefore, to eliminate it from his diet.

When persons are sensitive to more than one food, as many allergic patients are, great care must be exercised in planning the diet. It is well to work out a food list so that no available food may be overlooked. If the diet is to be continued for more than 1 week, it is imperative that it be evaluated for proteins, calories, minerals and vitamins. Often it is advisable to supplement the diet by mineral or vitamin concentrates, by additional quantities of sugar and oils for calories and by increased quantities of the nonoffending protein foods. See Chapter 50 for allergy recipes.

Protein hydrolysates are given sometimes as a substitute for milk protein in milk-free diets. So-called "Soybean milks" are also used as well as additional meat and eggs, if tolerated.

TEACHING THE PATIENT

The patient must be made food-conscious of the allergen to which he is sensitive, for even minute quantities may produce attacks. He must beware of commercial products of

whose composition he is not absolutely certain. This applies not only to the foods and drinks purchased in the market, but to those served in restaurants and other eating places, for prepared foods are often mixtures of various products. Packaged foods, according to our labeling law, must have their contents listed. This may be of help in determining whether the offending food is present.

The wheat-sensitive patient must learn that baker's rye bread contains some wheat flour; that practically all hot breads, griddle cakes, pastries and puddings are made chiefly or partly from wheat products; that bran and gluten are wheat derivatives. Thickened gravies and sauces are to be avoided unless the thickening agent is known. Even meat dishes, such as meat loaf and hamburger steak, may contain bread crumbs; and stuffed meats, such as bologna and sausages, some wheat flour or bread. All malted and cereal beverages must be avoided by the wheat-sensitive person.

The egg-sensitive patient likewise must investigate carefully all commercial products before partaking of them. He must remember that even the baking powder used in baked goods often contains dried egg white; that egg white may be used in the clearing of coffee and in the preparation of foaming beverages; and that most desserts, especially cakes, puddings and ice cream, contain eggs.

The milk-sensitive patient may find that he is able to use milk that has been boiled or dried; but if sensitive to all milk, he must avoid cheese, butter, and margarine, as well as all other foods containing even infinitesimal amounts of milk. Bread as purchased usually contains some milk. Therefore the home-made product is preferable.

It is well to note here that so-called "soybean milk" is an excellent milk substitute. It is made from soybeans, a vegetable protein of good biologic value and fortified with minerals. Its nutritive value is almost equal to milk with the exception of the vitamin content.

SKIN DISEASES

The causes of skin diseases are many, and some of them have not been established clearly. It is recognized fairly well that diet and hygiene have some bearing upon these diseases, but exactly how and why have not been proved definitely.

That the health of the individual has a direct effect upon the condition of the skin is generally conceded. Metabolic disturbances involving carbohydrate, fat and protein metabolism have been suspected of being causal factors, and while much research has been done, more evidence seems to be needed in order to establish these theories as specific factors.

Vitamin Deficiencies

Many vitamin deficiencies are known to be accompanied by skin manifestations, such as thickening, cracking, eruptions and bleeding. These have been described in Chapter 20. The treatment depends upon the correction of the deficiencies. Even when definite deficiencies may not be established, many dermatologists advise the use of high vita-

min diets often with vitamin supplementation.

Acne Vulgaris

Acne vulgaris is defined as "an inflammation of the sebaceous glands from retained secretions." It is common to oily skins and occurs most frequently on the face, chest and back. The lesions consist of pink papules, in the center of which appear little black spots known as blackheads. These may develop into annoying and disfiguring pustules.

Age Incidence. Acne usually appears during or following puberty, from 14 to 20 years of age. The condition has been attributed to a high-carbohydrate diet, although in one investigation it was found that 5 out of 10 patients improved when a high carbohydrate diet was given. A diet high in fat also has been suggested as a causative factor.

Probably the most important dietary aspect of treatment is to ensure that these adolescents have a highly nutritious diet, adequate to meet their needs during this period of rapid physical development.

STUDY QUESTIONS

1. How may food allergies be detected when skin tests fail?

2. What is the danger when patients are kept on test diets such as elimination diets for long periods of time?

3. Plan a week's menu for a patient who must follow Rowe's Elimination Diet No. 3.

4. Name three foods in which wheat may be used as an ingredient and of which a patient on a wheat-free diet must be warned; three foods in which milk may be the "hidden" ingredient; three foods in which eggs are the "hidden" ingredient.

5. Look on the label of a package of margarine. Why must a patient on a milk-free diet omit this food?

6. How may a patient be desensitized to a food allergy?

7. What substitute for milk is available and is nearly equal to milk in nutritive content?

Cardiovascular Diseases

CARDIAC DISEASES
CLASSIFICATION AND ETIOLOGY
DIETARY MANAGEMENT
VASCULAR DISEASES
ARTERIOSCLEROSIS
DIETARY TREATMENT
HYPERTENSION
DIETARY TREATMENT

CARDIAC DISEASES

Cardiovascular diseases constitute the greatest public-health problem of the present time. More people die from these diseases than any other one cause today. It is important, therefore, to understand the basic principles of treatment, including the modifications to be made in the diet.

Classification and Etiology

Diseases of the heart are classified as:

1. Functional
2. Organic:
   (a) Acute, compensated
   (b) Acute, decompensated
   (c) Chronic, compensated
   (d) Chronic, decompensated
   (e) Failure

Like most organs, the heart may be affected functionally or organically.

Functional disease may express itself by heart pain and by disturbances in the rate and the regularity of the heart action. Functional disease usually is benign and rarely produces organic disease of the heart. The principal causes of functional heart disease are excessive use of tobacco and alcohol, low-grade infections, nutritional deficiencies, especially that of thiamine, and, very commonly, psychoneurosis.

Organic disease of the heart is caused principally by rheumatic fever, hypertension and arteriosclerosis, sometimes by syphilis or thyroid disease, and it may be due to congenital malformations. These diseases cause most of the disability due to heart disease and nearly all the deaths resulting from heart disease.

Acute disease of the heart may accompany an attack of rheumatic fever or bacterial endocarditis, or it may occur without previous warning, as in coronary occlusion.

Chronic disease of the heart often is a result of one of the acute infections mentioned above. Sometimes it is a development of long-standing arteriosclerosis and hypertension. In pericarditis, there usually is a history of pulmonary tuberculosis. It may also be due to the presence of congenital malformation.

Compensation and Decompensation. In heart disease, little or much

of the cardiac structure may be involved. The valves, the endocardium or the lining of the heart, the myocardium or heart muscle, the pericardium or the outer covering of the heart, the blood vessels within the heart muscle, the great vessels leaving the heart and the conduction system in the heart may be diseased and, therefore, functioning poorly. The severity of heart disease depends on the degree of interference of cardiac action. It is common to classify heart disease in terms of the degree of ability to function. Thus, in compensated heart disease, although there is organic damage of the heart, it is able, nevertheless, to maintain satisfactory systemic circulation, and the patient's activity is only partly restricted.

Decompensated heart disease is said to occur when the heart is unable to sustain, by its beating, an adequate flow of blood to all the tissues of the body which require food and oxygen continually. As a consequence, the patient becomes sick and begins to show signs of distress when performing the activities which formerly were performed with ease and without discomfort. The principal signs of distress are shortness of breath and pain in the chest or the upper abdomen. As decompensation progresses, the liver becomes enlarged and edema appears in the dependent parts of the body and sometimes in the pleural and the peritoneal cavities. The patient usually is on bed rest.

Failure. When decompensation is severe, the patient is said to be in heart failure, and he is critically ill.

Role of Antibiotics and ACTH. Some infections of the circulatory system, particularly bacterial endocarditis, respond well to antibiotics, and this disease, which formerly was almost always fatal or extremely crippling, now has a much more favorable prognosis. In the past few years, rheumatic fever, a major cause of cardiac damage, has been treated with adrenocorticotropic hormone (ACTH) or cortisone with excellent results. The attack itself is shortened, and carditis either is very mild or does not occur at all.

Cardiac Surgery. In recent years, remarkable progress has been made in the field of cardiac surgery. Many types of congenital malformations have been partially or completely repaired and the patient returned to near normal or completely normal activity. Other types of heart lesions, such as pericarditis and stenosis of the valves, now can be treated surgically to return the patient to near-normal living. Unfortunately, there are many patients in whom the damage is too great or of a type that is unsuitable for surgery who will continue to be cardiac invalids and for whom the diet, among other things, remains of primary therapeutic importance.

Dietary Treatment

For patients with compensated heart disease, the diet is changed only slightly, the object being to supply an adequate diet and avoid additional burdens due to overeating. If, however, the patient is even slightly overweight, the caloric value of the diet should be reduced until the patient is somewhat underweight. Some doctors advise some reduction even in those who are not overweight. By reducing the weight

the heart is freer in its movements, and the metabolism is decreased, thus furnishing less stimulus to its activity.

The dietary principles for treatment of this type of disease are as follows:

(1) The avoidance of bulky meals to prevent distention of the stomach and constant pressure against the heart.

(2) The avoidance of constipation and straining.

(3) The avoidance of such foods as members of the cabbage family, dried peas and beans. These ferment easily, may cause gas in the alimentary tract and result in pressure against the heart.

(4) The avoidance of overeating and increase in weight, both of which throw an extra tax upon the heart and the blood vessels.

(5) The avoidance of any food known to the patient to be difficult to digest.

(6) The avoidance or the sparing use of stimulants. Sometimes tea and coffee are permitted in limited quantities.

Patients with severe decompensation or with heart failure are usually too ill to eat; the diet, therefore, is restricted very severely. Only water and fruit juices may be allowed, usually in limited amounts, or the patient may be placed on a Karrell diet, which consists of 200 cc. (6 ozs.) milk at 8 A.M., 12 NOON, 4 P.M. and 8 P.M. Later, cereal gruels, toast, soft cooked eggs, mashed or baked potatoes, vegetable and fruit purées, gelatin, custard and ice cream may be added, leading up to a soft diet. No salt is used in cooking or allowed on the tray.

Dietary Management of the Chronically Ill Cardiac Patient

As soon as the acute phase of cardiac failure has passed, the patient is placed on a diet that is as nearly nutritionally adequate as possible. The diet may be either soft or general, with the principles and modifications as follows:

Calories. If the cardiac patient is overweight it is essential that the caloric intake be diminished and that the patient lose weight. This measure tends to reduce basal metabolism and thus the work of the heart (see Chap. 18 for low-caloric diets).

Even for the cardiac of normal weight it may be beneficial to reduce the weight slightly below this level, in order to lessen the work of the heart.

However, many cardiacs, especially those suffering from rheumatic heart disease, are underweight and undernourished. Although it may not be possible or desirable to have them gain weight, every effort should be made to make the diet nutritionally adequate in protein, minerals and vitamins. (See Basic Dietary Pattern, Chap. 17.)

Protein. The protein of the cardiac diet should meet the normal standard of 1 Gm. per Kg. of body weight. The need for adequate protein for all body processes has been well established, and therapeutic diets should provide the necessary amounts unless contraindicated by the nature of the disease.

Carbohydrate and Fat. When the caloric value of the diet must be reduced, the reduction should come from both carbohydrates and fats. The carbohydrates, however, should be the chief source of energy, as

they are more easily digested and leave the stomach more quickly than the fats, thus providing more room for the working heart. For patients considerably below normal weight, it may be necessary to increase the intake of these foods slightly in order to raise the caloric intake. In either case bulky or gas-forming vegetables should be avoided, because they may cause pressure against the heart.

Vitamins and Minerals. These should be adequate in cardiac diets as in all other diets. If the appetite is poor, or the patient much debilitated, mineral and vitamin supplements are indicated.

Small meals are advisable to avoid pressure by the stomach on the heart. It may be desirable to divide the three regular meals, so that a part of each is served two or three hours later. The cereal and the milk from breakfast, and the dessert and part of the fluid from lunch and dinner may be served as between-meal nourishment. This lessens the amount of food in the stomach at any one time and may assure greater comfort for the cardiac patient.

Salt and Water. If edema is or has been present, the diet is usually limited in salt. Water may be restricted also, although at present most doctors believe that if the salt is limited, edema will not occur or, if present, will disappear. The sodium of the salt (sodium chloride) is the water-holding mineral of the body fluids. In an article on low-sodium diets, Blecha[1] estimates that the average person consumes from 2 to 3 level teaspoons of salt per day or approximately 4,000 mg. of sodium, most of which is excreted by the kidney. If he omits all salty foods, such as bacon, ham, salted crackers and salted butter, and uses no salt at the table, the diet will contain approximately 2,000 mg. sodium.

In the cardiac patient there is usually impaired circulation, so that the blood does not reach the kidney as frequently, and less excretion of sodium results. There may also be high venous pressure which serves to keep sodium and fluids from being re-absorbed into the blood from the interstitial spaces. Together, these two factors may cause edema or retention of water and sodium in the tissues.

For this reason salt must be limited, and other compounds containing sodium such as sodium bicarbonate or baking soda must be eliminated entirely.

Seasonings for a Salt-Restricted Diet. Many patients have a difficult time adjusting to the omission of salt from their food. There are many seasonings and flavorings which will help to make the diet more palatable, and every effort should be made to incorporate these into the diet. A wedge of lemon will increase the flavor of many meats and vegetables. Sugar and minced parsley or mint will add variety to the vegetables. The use of brown sugar and dried fruit with cereal will almost completely mask the lack of salt. Other flavorings which may be used with good results are salt-free tomato juice, onions, if tolerated, sweet spices such as cinnamon, cloves and paprika, and a variety of herbs. Rum and peppermint extracts also may be used to give flavor to desserts such as puddings and ice cream.

[1] Blecha, E.: Am. J. Nursing 51:464, 1951.

Fortunately, most spices contain a minimum of sodium and may be used freely. Exceptions are celery and onion salt and celery and parsley flakes. See Table 7, Part Four, for sodium content of spices.

The method of preparation may also affect the flavor of foods. Baking, broiling or roasting, as well as frying, will make many foods more palatable than boiling or steaming. Frying should be done with as little fat as possible, for most sick people do not easily digest fat-laden foods. (See Chap. 50 for low-sodium recipes.)

A booklet,[2] *Planning Low Sodium Meals*, similar to Meal Planning and Exchange Lists for the diabetic patient (see Chap. 21), has been published by the Newton (Mass.) Health Department in conjunction with the Massachusetts Department of Public Health and other agencies in the community as part of the Heart Demonstration Program. The booklet lists foods which have approximately the same sodium, as well as protein, fat and carbohydrate content, and may be exchanged for each other. The diet as a whole is guided by the prescription of the doctor. The booklet also contains valuable suggestions for the use of spices, as well as some recipes, and lists clearly the foods, the cooking ingredients and the condiments which should be avoided.

Low-Sodium Diets for Cardiac Patients

Terminology. There are many degrees of salt restriction, depending on the severity of the cardiac disease and the amount of edema present. The so-called salt-poor, salt-free or low-sodium diets contain varying amounts of sodium, depending upon the content of the natural food, the amount of salt that is added in the preparation or cooking and also the amount added at the table. Formerly, these diets were known as low-salt (no salt added at the table) or salt-free (no salt used in cooking or at the table). Since it has been found that the retention of sodium is the chief causative factor in edema, the word sodium now appears more frequently in the terminology.

On the following pages a group of variously restricted sodium diets is given.

1. **Moderately low sodium,** 1.2-2.0 Gm. (1,200-2,000 mg.). This diet is usually ordered for the patient who has only moderate heart damage. It allows a limited amount of salt in cooking, although none is served on the tray or at the table. All salted foods such as bacon, ham, salted crackers and salted butter must be omitted.

2. **Low sodium,** 0.6-1.2 Gm. (600-1,200 mg.). This diet is usually prescribed for cardiac patients with edema. Salt is eliminated both in cooking and at the table, and foods of low or moderately low sodium content are chosen. Fruits and vegetables form an important part of the diet.

3. **Very low sodium,** 0.2 Gm. (200 mg.) or less. This diet is more frequently prescribed for patients with arteriosclerotic heart disease and hypertension, or for edematous cardiac patients who have not improved on the low-sodium diet but

[2] Planning Low Sodium Meals, Newton Health Department, Newton, Mass.

need further restriction. Only foods of relatively low-sodium content are allowed. Whole milk is replaced by low-sodium or dialyzed milk.

Three low-sodium diets for cardiac and hypertensive patients follow, including the foods that are allowed and those that are to be avoided. The very low-sodium diet appears in the section on Vascular Diseases.

VASCULAR DISEASES

Arteriosclerosis

Until recently, arteriosclerosis was thought to be part of the normal aging process. Today, more and more, it is considered to be a disease entity. Arteriosclerosis or atherosclerosis, probably part of the same process, occurs when there is fatty infiltration of the lining of the blood vessels. Necrosis occurs and is followed by calcification, resulting in a hardening of the affected tissues with loss of elasticity of the vessels. The larger vessels are the ones most affected, but even the arterioles become sclerotic. This is particularly true of the vessels of the kidneys. When the above condition exists it naturally calls for more pressure on the part of the heart to force the blood through the vessels. Therefore, it is not surprising to find that

Moderately Low Sodium Diet

(Containing approximately 1.2 to 2 Gm. (1,200–2,000 mg.) sodium)

Foods Allowed:

Milk	500 cc. (2⅛ cups) of milk, cream or cream soup.
Egg	One.
Meat, fish, poultry	One 60 Gm. (2 ozs.) serving plus one 30 Gm. (1 oz.) serving; or one 90 Gm. (3 ozs.) serving.
Cereal	One serving.
Bread	Three slices, whole-grain or enriched.
Unsalted butter	As desired.
Fruit	As desired.
Vegetables	Fresh, frozen or canned vegetables as desired.
Dessert	One dessert daily, other than fruit.
Cheese	Unsalted pot cheese or cottage cheese.

Foods to Be Avoided:

Meat, fish	Cured meat and fish, such as ham, bacon, sausage. Fish if processed with brine. (Frozen fish and fish fillets are often so processed.)
Fat	Salted butter or margarine, salted mayonnaise, salted French dressing and bacon fat.
Cheese	All cheeses except salt-poor pot cheese or cottage cheese.
Miscellaneous	Salted nuts, salted crackers, salted broths; condiments such as catsup, chili sauce, prepared mustard, steak sauces, celery salt, onion salt.

Note:—The above allowed foods may be made up into any desired normal menu, using as a basis the low-sodium menu which follows, but it will be remembered that a limited amount of salt may be used in the cooking of the food, especially the meats and the vegetables. No salt, however, is served at the table. If the patient is hospitalized, a bland diet without the salt-shaker may be served.

Low-Sodium Diet

(Containing approximately 0.6 Gm. or 600 mg. sodium)

Foods Allowed:

Milk	500 cc. (2⅛ cups) milk, cream or cream soups.
Egg	One.
Unsalted meat, fish, poultry	One 60 Gm. (2 ozs.) serving plus one 30 Gm. (1 oz.) serving, or one 90 Gm. (3 ozs.) serving.
Unsalted cereal	Unsalted cooked cereals, puffed rice, puffed wheat, shredded wheat, rippled wheat.
Unsalted bread	As desired.
Unsalted butter	As desired.
Fruit	As desired.
Unsalted vegetables	Fresh or frozen vegetables, as desired, except those to be avoided (see below).
Dessert	One dessert daily other than fruit.
Cheese	Salt-poor pot cheese or cottage cheese.
Miscellaneous	Sugar, olive oil, vegetable oils, vinegar, shortenings, lard, jelly, fruit jam, marmalade, honey, cocoa (not Dutch process).
Seasonings	Lemon juice, fresh mushrooms, tomato juice without added salt, paprika, onions, garlic, cinnamon, cloves, all-spice, caraway, curry powder, ginger, mace, nutmeg, sage, thyme, and extracts of rum, vanilla, walnut, lemon and peppermint.

Foods to Be Avoided:

Salt and foods prepared or preserved with salt	"Soda" (sodium bicarbonate), baking powder, self-rising flours and mixes.
Meat, fish	Cured meat and fish, such as ham, bacon and sausage. Fish if processed with brine. (Frozen fish and fish fillets are often so processed.)
Cereals	All cereals except those allowed.
Fat	Salted butter or margarine, salted mayonnaise, salted French dressing, bacon fat.
Vegetables	Beets, kale, Swiss chard, spinach, celery, frozen peas, frozen Lima beans; all commercially canned vegetables.
Cheese	All cheese except salt-poor pot cheese or cottage cheese.
Miscellaneous	Salted nuts, salted crackers, salted broths; pickles, olives, condiments such as catsup, chili sauce, prepared mustard, steak sauces, celery salt, onion salt.

TYPICAL LOW-SODIUM MENU

(Containing approximately 0.6 Gm. or 600 milligram sodium)

MEAL	FOOD ITEMS	AMOUNT ALLOWED	SODIUM mg.	PROTEIN Gm.	FAT Gm.	CARBOHYDRATE Gm.	CALORIES
		Gm.					
Breakfast:	Grapefruit	½ medium. 100	1	1	..	10	40
	Unsalted oatmeal	1 serving... 100	1	2	1	11	63
	Egg	One ... 50	40	6	6	...	77
	Unsalted bread	1 sl. ... 23	7	2	1	12	63
	Unsalted butter	2 tsp. ... 10	...	..	8	...	72
	Milk	½ glass... 100	50	3.5	4	5	68
	Sugar	1 tbsp. ... 12	...	..	..	12	48
	Coffee, if allowed	1 pot	...	..	..	...	.....
			99	14.5	20	50	431
Lunch:	Unsalted spaghetti	⅔ cup... 100	1	5	1	30	149
	with unsalted tomatoes	½ cup... 100	1	1	..	4	19
	and unsalted ground beef	1 oz. ... 30	15	7	6	...	83
	Unsalted asparagus	1 serving... 100	2	2	..	4	20
	Lettuce	1 serving... 50	6	..	..	2	7
	Unsalted French dressing	1 tbsp. ... 15	...	..	5	3	59
	Fresh pear	1 medium.. 100	2	1	..	16	63
	Unsalted bread	1 sl. ... 23	7	2	1	12	63
	Unsalted butter	2 tsp. ... 10	...	..	8	...	72
	Milk	1 glass... 200	100	7	8	10	136
			134	25	29	81	671
Dinner:	Unsalted roast lamb	2 ozs. ... 60	49	14	11	...	184
	Unsalted parsley potato	1 small... 100	1	2	..	19	83
	Unsalted carrots	1 serving... 100	31	1	1	6	30
	Orange and apple salad	1 serving... 100	2	1	..	14	52
	Unsalted mayonnaise	1 tbsp. ... 15	1	..	11	...	99
	Tapioca pudding	1 serving... 100	100*	5	5	21	149
	Unsalted bread	1 sl. ... 23	7	2	1	12	63
	Unsalted butter	2 tsp. ... 10	...	..	8	...	72
	Milk	1 glass... 200	100	7	8	10	136
			291	32	45	82	868
		Totals for the day	524 mg. Na	71.5 Gm. P	94 Gm. F	213 Gm. C	1,970 Cals.

The protein, the fat and the carbohydrate figures are obtained from the individual analyses in Table 1, Part Four.

The sodium figures are obtained from Table 7, Part Four.

*Approximate.

cardiac enlargement and hypertension or high blood pressure is associated with this disease.

Dietary Treatment

In the past few years it has been shown that patients with atherosclerosis have persistently high blood levels of cholesterol. Also, it has been found that this substance appears in the fatty plaques in the lining of the blood vessels. However, a diet low in cholesterol does not reduce the blood levels of cholesterol to any extent. This is due probably to the fact that the body is able to manufacture this essential material, thought to be the precursor of the sex hormones, vitamin D and the adrenal cortex hormones, from much simpler materials produced normally in metabolism.

There does seem to be a relationship between the levels of fat intake, the blood cholesterol and the prevalence of atherosclerosis. Keys[3] has found that in countries where the fat intake is habitually low, the blood cholesterol levels are lower and the incidence of atherosclerosis is less than in countries where there is a high fat intake. Atherosclerosis and resultant heart disease are among the first causes of death in the United States, and this may well be due to the overnutrition and the obesity prevalent in this country.

Much disagreement exists among clinicians as to the dietary treatment of the disease. All agree that weight reduction is important if overweight is present. (See Chap. 18 for low-caloric diets.) Most investigators feel that restriction of cholesterol in the diet is not beneficial and actually may lead to malnutrition, since the food sources of cholesterol are among our most important foods from the standpoint of normal nutrition. Other physicians, among them Morrison,[4] believe that an extremely low-fat (25 Gm.), low-cholesterol (75 mg.) diet has proved to be of value in the patient with atherosclerosis. Such a diet may be constructed from the low fat diet in Chapter 25, omitting egg yolk and substituting skim milk for whole milk, and omitting or limiting foods containing cholesterol as listed in Table 6, Part Four.

When atherosclerosis has progressed to the point of cardiac damage, diets low in sodium may be indicated. These are described earlier in this chapter. Or if hypertension has resulted, the Kempner rice diet, described on page 364, may be of value.

HYPERTENSION

Hypertension may result from arteriosclerosis or kidney disease, but it occurs more frequently as a separate disease entity of unknown etiology. In most patients it is benign for many years, although eventually cardiac failure, cerebral hemorrhage or chronic kidney disease may follow. When hypertension occurs in young people it is termed essential hypertension, and if this progresses rapidly to cardiac and kidney failure, it is known as malignant hypertension.

It is a problem of major importance in the public-health field, since it is occurring more frequently than

[3] Keys, A.: The Lancet, Aug. 2, 1952, p. 209.

[4] Morrison, L. M.: J.A.M.A. **145**: 1232, 1951.

formerly and is the chief cause of disability in middle age. It is also the most frequent cause of heart failure in adult life.

The following table, by Riesman,[5] presents the average blood pressure of men at varying ages. Any pressure that is decidedly above or below these figures is considered abnormal.

AVERAGE BLOOD PRESSURE OF MEN (UNITED STATES AND CANADA)

Age	Systolic	Diastolic	Pulse Pressue
20....	120	80	40
25....	122	81	41
30....	123	82	41
35....	124	83	41
40....	126	84	42
45....	128	85	43
50....	130	86	44
55....	132	87	45
60....	135	89	46

DIETARY TREATMENT

As in arteriosclerosis, there is great difference of opinion in regard to the dietary treatment of hypertension and hypertensive diseases. In an admirable review of the subject, Page[6] says, "In overweight hypertensive patients the total caloric intake should be reduced, and that marks about the only area in which agreement exists."

Clinical experience has shown that obesity is conducive to hypertension. The patient should be placed on a low caloric diet (see Chap. 18) until his weight is at normal or just below normal levels for his height and build. After this, he should be kept on the required calories to maintain this weight.

If cardiac damage has resulted from the hypertensive disease, one of the diets low in sodium described earlier in this chapter is indicated. For kidney involvement, see Chapter 28 for dietary treatment.

The role of sodium in the treatment of hypertension is a much discussed subject in medical literature today, but experimental work has seemed to indicate that the rigid restriction of sodium in the diet has resulted in a decided reduction in the blood pressure of hypertensive animals and humans. By the use of the rice diet and diets low in sodium, Kempner,[7] Grollman[8] and others[9] have presented evidence that many hypertensive patients have been helped by a drastic restriction in sodium.

The Kempner[10] rice diet is a fairly new development in the treatment of hypertensive vascular disease and kidney disease. Kempner[11] reports beneficial results in 138 of 213 patients treated. The diet consists of rice, fruit, fruit juices and sugar and contains approximately 2,000 calories, 20 Gm. of protein, 5 Gm. of fat and 460 Gm. of carbohydrate. It contains only 0.2 Gm. or 200 milligrams (mg.) of sodium. The fluid intake is limited to from 700 to 1,000

[5] Riesman, David: J.A.M.A. **96**:1105, 1931.

[6] Page, I. H.: J.A.M.A. **147**:1311, 1951.

[7] Kempner, Walter: North Carolina M. J. **5**:125, 273; **6**:62, 117, 1944-45.

[8] Grollman, Arthur, *et al.*: J.A.M.A. **129**:533, 1945.

[9] Watkin, D. M.: Am. J. Med. **9**:441, 1950.

[10] *Op. cit.*

[11] *Op. cit.*

cc. of fruit juices, no water being allowed.

Kempner describes the diet as follows:

> The average patient can eat 200 to 300 Gm. or 6½ to 10 ounces of rice daily, which will provide 700 to 1,050 calories. The additional calories required must be supplied by the liberal use of sugar and fresh or preserved fruits. All fruits are allowed, with the exception of dates, avocados and any dried or canned fruit or fruit derivatives to which substances other than sugar have been added. No salt is permitted. All fruit juices are allowed, but tomato or vegetable juices are not given. Brown or white sugar may be used ad libitum. Any kind of rice is used. The rice is boiled or steamed in plain water or fruit juices, without salt, milk or fat.

The diet is supplemented with vitamins and iron. See Chapter 50 for recipes permitted on this diet.

Grollman[12] says that "it is very probable that the incidental salt restriction is responsible for the results reported recently by Kempner." Grollman chose foods of very low sodium content and further reduced this factor by including 1,400 cc. of dialyzed milk which is practically free of sodium but retains its protein, thus contributing approximately 50 Gm. to the diet.

The **very low sodium diet,** outlined on page 366, differs from the preceding low-sodium and the moderately low-sodium diets in the following respects:

1. The sodium is restricted to 0.2 Gm. (200 mg.) per day or less.

2. No salt is added, either in cooking or at the table.

3. Only foods of low-sodium content are permitted except certain essential foods, such as eggs and meat; these are chosen from the lower sodium ones in the group and are limited in quantity. For example, egg yolks are much lower in sodium than egg whites (see Table 7, Part Four); hence, one whole egg only is permitted in one day, but an additional egg yolk may be added if desired.

4. Salt is removed from certain essential foods, such as milk and butter. (If sweet butter is not available, the salt may be removed by kneading it for several minutes in cool water.) Sodium is removed from milk by dialysis. A very low-sodium milk known as Lonalac is now on sale in most drugstores. Dialyzed milk may also be obtained from certain milk companies.

5. The low-sodium diet is decidedly lacking in flavor, due to the very low content of sodium, which is the chief flavoring constituent of foods. Much can be done, however, to make it less objectionable if due consideration is given to (1) the preparation—avoiding overcooking, etc.; (2) to the appearance—garnishes, etc., and (3) to the use of such seasonings as are mentioned earlier in the chapter. Certain salt substitutes may be used but only those approved by authoritative sources should be tried. Recent direful results have come from the use of substitutes containing lithium chloride. Dr. Grollman[13] has developed a salt substitute which has been used very successfully in some of the Southern hospitals and elsewhere. It is "a mixture of potassium chloride, one part; potassium citrate, two parts; and ammonium chloride, one

[12] *Op. cit.*

[13] Personal communication.

Very Low Sodium Diet for Hypertension

Foods Allowed:

Milk	Low-sodium milk only; 2 ozs. cream.
Cheese	Made from low-sodium milk; or cottage cheese washed 3 or 4 times in hot water before using.
Fats	Unsalted butter only; oils; vegetable shortenings.
Eggs	One a day, plus an egg yolk.
Meat, fish, fowl	Beef, lamb,* mutton,* calves' liver,* veal; chicken, duck or turkey, breast meat preferably; halibut, salmon, cod, catfish, oysters (fresh or frozen). No fish fillets.
Soups	Vegetable cream soups made with low-sodium milk only.
Bread, cereals, Italian pastes	Yeast or hot breads made without salt; matzoth, plain; all cooked cereals and cereal flours; puffed rice and wheat, shredded wheat; macaroni, spaghetti, noodles made without salt.
Vegetables	All fresh vegetables except those listed below to be avoided.
Fruits	All fresh fruits and fruit juices; dried, canned or frozen fruits may also be used unless label states salt or sodium benzoate has been added.
Desserts	Fruits as listed above; fruit pies made with unsalted crusts; rice, cornstarch and tapioca puddings made with low-sodium milk; ice cream made with low-sodium milk; gelatin prepared with water, fruit or fruit juice and sugar; cookies made without salt, soda or baking powder.
Beverages	Tea, coffee, postum, cocoa, tomato juice without added salt, fruit juices, gingerale.
Condiments and flavorings	Vinegar, lemon juice, mushrooms, tomato juice without added salt, paprika, onions, garlic, cinnamon, cloves, allspice, caraway, curry powder, ginger, mace, nutmeg, sage, thyme, vanilla, lemon, rum and peppermint extracts.
Miscellaneous	Sweet butter, jelly, fruit jam, marmalade, honey, syrup made with white sugar, nuts (raw or roasted without salt), unsweetened chocolate, cocoa (not Dutch process).

Foods to Be Avoided:

Milk	Fluid milk, evaporated, dried whole or dried skim milks, because of their high sodium content.
Cheese	All cheese, unless made from low-sodium milk.
Fats	Butter, margarine, salted, as ordinarily sold on the market.
Meat, fish, fowl	Canned meats, fish, poultry; all dried or preserved fish, meat, poultry.
Vegetables	Beets, kale, Swish chard, spinach, celery, frozen peas and lima beans, all commercially canned vegetables.
Miscellaneous	Salted nuts, salted crackers, salted broths; pickles, olives, condiments such as catsup, chili sauce, prepared mustard, steak sauces, celery salt, onion salt.

* Once weekly.

VERY LOW SODIUM DIET FOR HYPERTENSION
(Containing less than 0.2 Gm. or 200 milligrams of sodium)
TYPICAL MENU

Meal	Food Items	Amount Allowed		Na*	Calories**
			Gm.	mg.	
Breakfast:	Orange, sliced		100	0.3	45
	Shredded wheat		30	0.6	100
	with low-sodium milk	½ cup	120	2.6	70
	Cinnamon toast	2 sl.	46	14.0	126
	Butter, sweet	2 tsp.	10	.....	70
	Coffee			.....	.....
	Cream, light	1 oz.	30	12.0	60
	Sugar	1 tbsp.	15	.....	60
				29.3	531
Dinner:	Chicken breast, roast		75	60.0	150
	Lima beans, fresh		100	1.0	95
	Eggplant, fried with		100	0.9	24
	vegetable fat	1 tbsp.	15	0.5	135
	Head lettuce		50	6.0	8
	with unsalted French dressing	1 tbsp.	15	.....	45
	Bread, unsalted	1 sl.	23	7.0	63
	Butter, sweet	2 tsp.	10	.....	70
	Fruit jello (gelatin, fruit juice, fruit)		100	2.0	110
	Cocoa with low-sodium milk		240	6.2	140
	Sugar	1 tsp.	5	.....	20
				8.36	860
Supper:	Eggs, scrambled	1 whole egg and	50	40.0	80
		1 egg yolk	15	3.6	50
	Tomatoes, sliced		100	3.0	20
	Potato, baked		100	0.8	100
	Bread, unsalted	1 sl.	23	7.0	63
	Butter, sweet	2 tsp.	10	.....	70
	Grapes		100	3.0	70
	Coffee			.....	.....
	Cream, light	1 oz.	30	12.0	60
	Sugar	1 tsp.	5	.....	20
				69.4	533
		Totals for the day		182.5 mg. Na	1,924 Cals.

*Sodium values from Table 7, Part Four.
**Caloric values from Table 1, Part Four.

part. These salts are ground together into a powder and used as a salt substitute. The relative proportions of the different salts may be altered to suit one's taste, but in general this mixture gives an adequate salt substitute."

However, salt substitutes should never be used except by permission of the physician. Salt substitutes containing potassium are contraindicated if kidney involvement is present.

Everything possible must be done to make the low-sodium diet palatable; otherwise, patients refuse to continue the treatment. It is generally agreed, however, that this diet should not be continued for many weeks, especially if there are complications of the kidneys or the heart. Excessive salt depletion may seriously affect the functioning of these organs. This is especially true if the patient should be receiving mercurials.

STUDY QUESTIONS

1. Make out a menu for a day for a 40-year-old patient recovering from cardiac failure who is allowed the following foods: 800 cc. (24 ozs.) milk, cream soups (inclusive of the milk allowed), soft-cooked eggs, refined bread toast, butter, custard and junket (within the milk allowance), gelatin, baked potato, fruit and vegetable juices up to 200 cc. (6 ozs.), all to be prepared without salt.

2. Will the above menu meet all the patient's nutritive requirements? What nutrients are likely to be low? How can some of these be made up?

3. What are the differences in the salt allowances of a moderately low and a low-sodium diet? How is each of these two diets restricted to meet the salt limitation?

4. What cooking ingredients and seasonings must a patient on a salt-poor diet be warned not to use? What two substances must be omitted from canned foods?

5. What seasonings, spices and condiments may be used to make a salt-poor diet more palatable?

6. Make out a menu for a patient on a 1,500 calorie, low-sodium diet who must carry his lunch.

7. Make out a menu for a day for a very low-fat, low-cholesterol diet, using Tables 1 and 6 in Part Four.

8. Make out a menu for a day for a patient on a Kempner rice diet. What are some of the problems this diet raises?

CHAPTER TWENTY-EIGHT

Diseases of the Urinary Tract

FUNCTIONS OF THE KIDNEYS
NEPHRITIS
GLOMERULONEPHRITIS
ACUTE
CHRONIC
NEPHROSCLEROSIS
NEPHROSIS
UREMIA
URINARY CALCULI

FUNCTIONS OF THE KIDNEYS

The kidneys have been described as the "excretory servant of the body." Their chief function is to preserve the normal composition of the blood. They respond to the changes in the blood which occur both in health and in disease by changing the concentration of substances in the urine and thus preserving the normal composition of the blood. Practically all the waste products resulting from metabolism are carried by the blood to the kidneys, where the blood is filtered and the waste products are eliminated. The kidneys are subject to many diseases, the principal ones being infections, diseases of the vascular system and diseases of metabolism.

The kidneys are indeed a great filtering plant, provided as they are with about two million units called nephrons or renal units, each of which contributes its mite to the performance of this function. The nephron consists of a tuft of capillaries—the glomerulus—surrounded by a covering or capsule which merges into a long winding tubule. The fluid which filters through the glomeruli is a protein-free filtrate of the blood plasma. This passes through the tubules, where much of it is reabsorbed into the blood; the remainder passes on through the collecting tubules into the pelvis of the kidney. This fluid is the urine which is passed by the ureters into the bladder, where it accumulates and in due time is eliminated from the body. (See Fig. 69 and Plate 3.)

Water is by far the chief constituent of the urine, the quantity varying mainly with the amount taken into the body and the amount excreted by means of the skin and the lungs. Normal urine contains only about 5 per cent of solids, consisting of salts, both basic and acid, and the end products of protein metabolism, of which the largest constituent is urea. If, for any reason, these products are not fully eliminated, they are then found in abnormal quantities in the blood. Therefore, a blood chemistry test is often a determining factor in the diagnosis of kidney diseases.

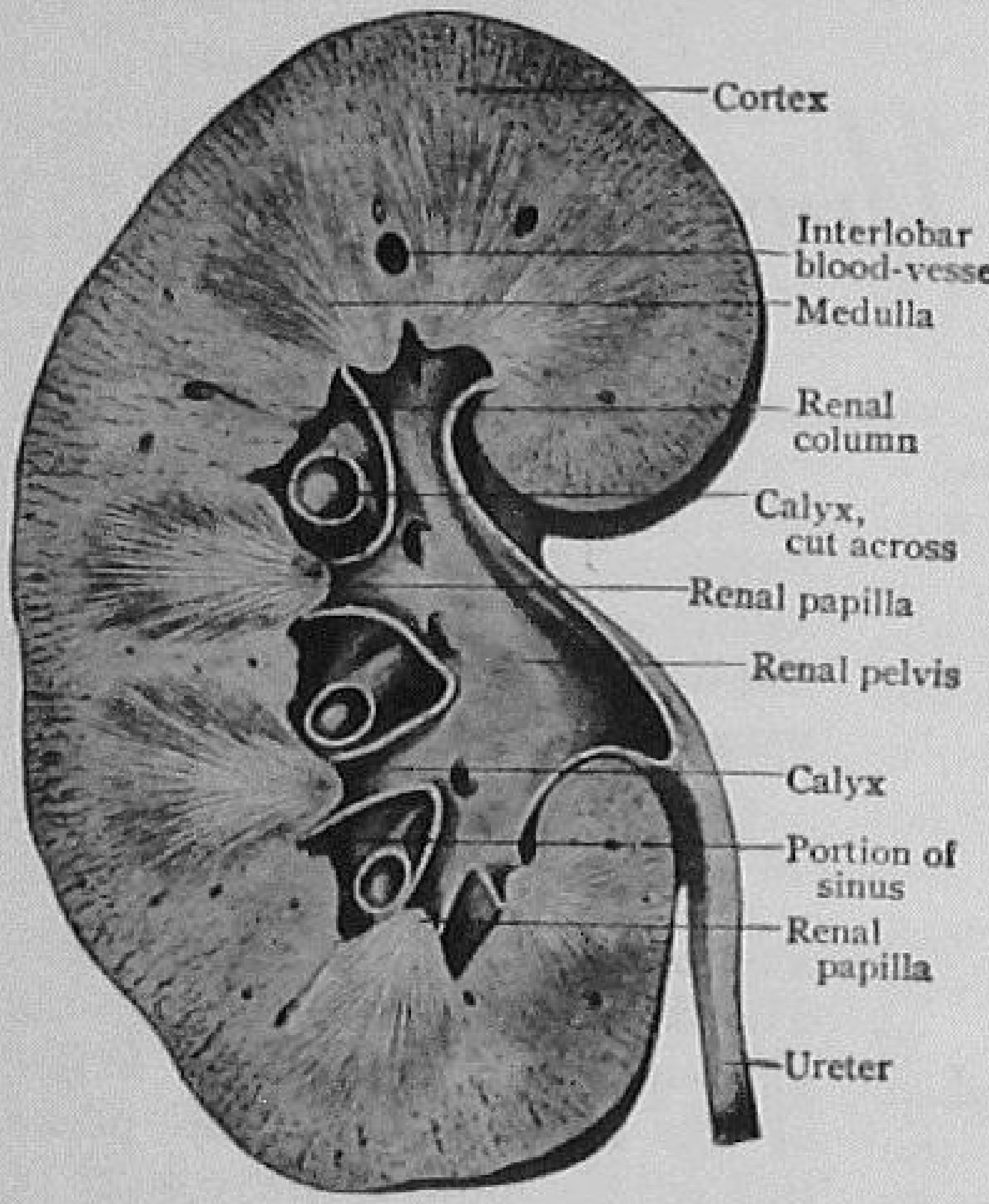


FIG. 69. A section through a kidney showing the cortex more or less striated due to the parallel tubules which merge into the medullary rays sections or medullas. From the apex of each medulla (renal papilla) urine passes into the renal calyx, collects in the renal pelvis, and is finally eliminated through the ureter. (Piersol, G. A.: Human Anatomy, Philadelphia, Lippincott)

NEPHRITIS

Nephritis, known also as Bright's disease, is a general term used to denote disease of the kidney due to inflammation or to degenerative changes. Different parts of the nephron unit may be affected in varying degree. For example, most cases of nephritis show the principal injury in the glomeruli, but in some cases changes in the tubules may be more prominent.

Etiology. Nephritis may follow a generalized infection such as scarlet fever or hemolytic streptococcus throat. Since it is the glomeruli which are affected, this type of kidney damage is usually called glomerulonephritis. Nephritis also may occur in long-standing degenerative changes in the blood vessels as a result of arteriosclerosis. This is known as nephrosclerosis. Glomerulonephritis occurs more commonly in the younger age groups, while nephrosclerosis is associated with middle and later life.

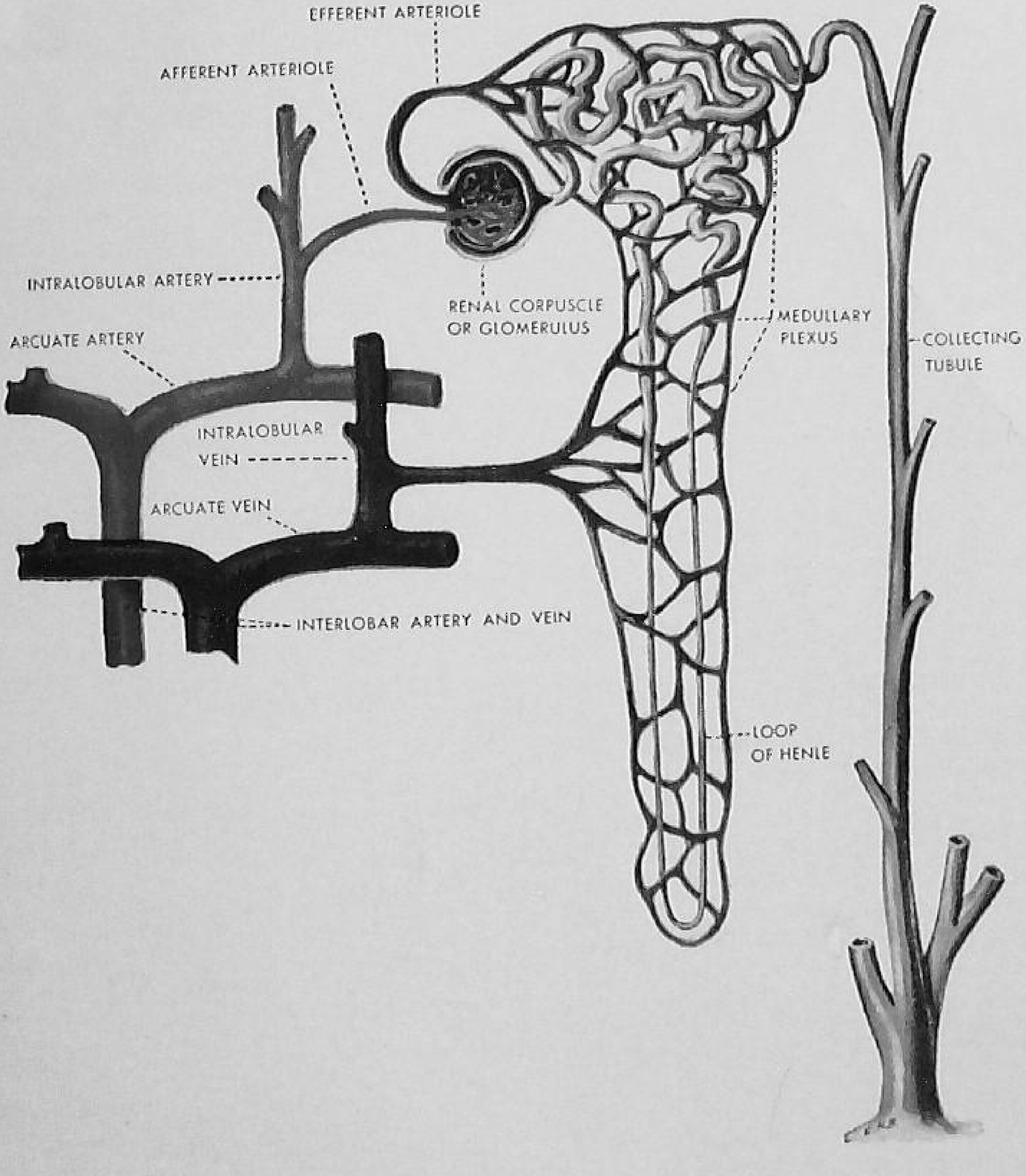
GLOMERULONEPHRITIS

Glomerulonephritis may be acute, subacute or chronic; and it may be complicated by edema or uremia, the latter being the result of the accumulation of protein waste products in the blood. Nephritis may be of short duration, as in the acute form, or of many years' duration, as in the chronic type. It is evident that no one type of diet is applicable to all kinds of nephritis.

ACUTE GLOMERULONEPHRITIS

Etiology and Symptoms. Acute glomerulonephritis is characterized by inflammation of the kidney following some of the contagious dis-

PLATE 3



A schematic drawing of the nephron, showing arterial and venous circulation. Water and water-soluble substances are filtered from the glomerular blood capillaries into the tubule. In the tubule, all of the glucose and much of the water, sodium and other components of the glomerular filtrate are reabsorbed into the surrounding capillary bed. The remainder passes from the collecting tubule into the pelvis of the kidney and, finally, by way of the uterers, into the bladder. (Sharp and Dohme's *Seminar*, vol. 9, No. 3, August, 1947.)

eases of childhood, such as scarlet fever or chickenpox. It may also follow tonsillitis, sinusitis, pneumonia or influenza. It occurs more frequently in childhood or early adult life than in later years. It is often characterized by a diminished secretion of the urine, a condition known as oliguria; by nausea and vomiting; and by edema and hypertension. The urine contains albumin, casts and red and white blood cells. The disease usually is self-limiting, and complete recovery results. In a few cases the disease may go on to chronic glomerulonephritis.

Dietary Treatment

The aim in the treatment of such a condition is rest for the kidneys, disregarding, if necessary, for a few days the general nutrition of the patient.

Fluids should be limited to a little more than the output. The total fluids usually are restricted to from 800 to 1,000 cc. Orange or other citrus fruit juices may be substituted for water. As the oliguria diminishes the fluids are increased.

Salt. When edema is present the diet is restricted in salt. (See Low-Sodium Diets, Chap. 27.)

Foods Allowed. During the first days of the acute disease, the patient is given very little food except the fruit juices mentioned above, 1 or 2 glasses of milk, cereals, toast with unsalted butter, jelly or jam, and fresh or cooked fruits. For the first 2 or 3 weeks, protein may be restricted. It should be remembered that such a regimen is for a short time only, after which the patient gradually returns to a normal diet.

CHRONIC GLOMERULONEPHRITIS

Symptoms. Chronic glomerulonephritis is insidious in its onset. The symptoms are usually so mild at first that the subject is not aware of his condition until his attention is drawn to it, perhaps when taking an examination for obtaining life insurance. The urine is usually abundant in quantity and of low specific gravity, and it may show much or comparatively little albumin and few casts. There may be morning headache, and the patient may be annoyed by the necessity of frequent urination during the night, which indicates that the kidneys are having to work overtime to complete their task. As time goes on, these symptoms become more severe; polyuria develops, the blood pressure rises, and there is urea nitrogen retention in the blood. Edema, which is usually present at least to the extent of producing a puffiness under the eyes, may increase due to increased loss of albumin in the urine, causing a lowered level of serum protein. Uremia, like coma in diabetes, is a very serious complication, the treatment for which is described later in this chapter.

Dietary Treatment

Protein. There are two schools of thought regarding the protein content of the diet in chronic glomerulonephritis. One group holds that the loss of serum protein in the form of albumin from the kidneys must be compensated for by a relatively high protein diet. For an adult with glomerulonephritis, these physicians prescribe 75 Gm. of protein per day for normal maintenance plus a sufficient amount to make up for the loss

of protein excreted in the urine. This may bring the protein intake up to 100 to 125 Gm. a day. The second group believes that kidney healing is more likely to occur, or at least the progression of the disease is slowed down, by the use of a low-protein diet. Clinicians favoring this regimen allow no more than 40 to 50 Gm. of protein per day. With the low protein diet care should be taken to include as much complete protein as possible and to distribute the complete protein foods throughout the three meals, in order to obtain the best utilization possible. (See Chap. 4.)

Salt. McLester and Darby[1] recommend "that in all forms of nephritis, the intake of salt should be restricted to a reasonable degree. When edema is present, salt should be limited to that contained in the natural food. No salt should be used in the preparation of the food and none added after it comes to the table; this permits the equivalent of about 2 Gm. of sodium chloride daily." In nephritis, some physicians also limit the use of other condiments. However, there are many ways in which salt-poor foods may be made more palatable. (See Chap. 27 for suggestions and Chap. 50 for recipes.)

It needs to be noted also that salt substitutes which contain potassium, which may be permissible in cardiac disease, are contraindicated in disease of the kidney. The kidney may not be able to eliminate potassium, and serious changes in electrolyte balance may result.

[1] McLester, J. S., and Darby, W. J.: Nutrition in Health and Disease, ed. 6, Philadelphia, Saunders, 1952.

Fluids. Water and other fluids are usually not restricted, as a good fluid intake is essential for the removal of waste products. Fluids may be increased if urea nitrogen retention is present to any degree.

High-Protein, Low-Sodium Diet. Such a diet will be found on pages 340 and 341 in Chapter 25, noting the suggestions at the bottom of these pages for making the diet salt-poor. See also Chapter 50 for recipes for high-protein, low-sodium beverages.

Low-Protein, Low-Sodium Diet. This will be found on page 374. It should be noted that this diet is low in calories, which may make it inadequate for the nutritional needs of young patients. Suggestions for increasing the calories will be found at the bottom of the page.

NEPHROSCLEROSIS

Nephrosclerosis occurs among older patients and is usually the result of arteriosclerosis of long standing. (See Chap. 27.) The blood supply to the kidney has decreased gradually because of the thickening of the wall and the closing of the lumen of the blood vessels. Usually this is accompanied by increased blood pressure and is characterized by urea nitrogen retention in the blood. In the more severe cases, mild or moderate albuminuria also may be present.

Dietary Treatment

Calories. Many patients with arteriosclerosis and resulting kidney disease are overweight. If this is the case, the calories in the diet must be strictly limited so that the patient will lose weight. (See Chap. 18 for

low caloric diets.) If the patient is of normal weight, the diet should provide the normal caloric value, depending upon the activity of the patient, usually from 2,000 to 2,500 calories for the adult male.

Protein. If the urea nitrogen level of the blood is increased only slightly, the patient with nephrosclerosis may be allowed the normal amount of protein in the diet, so that his strength and vigor will be maintained as long as possible. When the blood urea nitrogen is elevated markedly, indicating inability of the kidney to excrete normal amounts of this waste product of protein metabolism, it becomes necessary to restrict the patient's protein intake to minimal levels, usually between 40 and 50 Gm. daily. This must include as much of the complete protein foods as possible, and these should be distributed among the three meals to ensure adequate utilization. Such a diet will be found on page 374. Although it is already low in calories, the caloric content may be reduced further by omitting the sugar and substituting saccharine or succaryl and by omitting the cream and some of the butter.

Salt. Although edema seldom is present in the early stages of nephrosclerosis, salt often is restricted moderately to save the kidney work. If edema occurs, the salt should be limited as outlined on page 372. (See also salt-restricted diets in Chapter 27.) Attention is called again to foods and flavors listed in Chapter 27 which help to make the low-sodium diet more palatable and to the low-sodium recipes in Chapter 50. Also, it needs again to be pointed out that patients with nephrosclerosis should not use salt substitutes containing potassium.

Nephrosclerosis in the early stages has been treated with very low-sodium diets by Grollman and Kempner with considerable success. (See Chap. 27 for diets.)

Fluids. Water and other fluids usually are given liberally in order to flush out urea and other waste products being retained, unless there is kidney closure with oliguria (scanty urine). In such cases, the amount of fluid given is closely correlated with the fluid loss not only from the kidneys but also from estimated losses from the skin and the lungs.

NEPHROSIS

True nephrosis is characterized by severe loss of serum albumin from the kidney, resulting in marked edema. It occurs only in young children and will be discussed in the chapter on children's diseases (Chap. 33).

The condition sometimes called the nephrotic syndrome of nephritis occurs in the terminal stages of both glomerulonephritis and nephrosclerosis, although less frequently in the latter. It is so called because of the massive albuminuria present with resultant marked edema. Theoretically, the diet should be high in protein and low in salt and fluids, but the patient is so ill that it may not be possible for him to ingest such a diet. High-protein, low-sodium beverages may be of value. These will be found in Chapter 50.

UREMIA

All degrees of urea nitrogen retention in the blood are called

LOW-PROTEIN—LOW-SODIUM DIET

MEAL	FOOD ITEMS	AMOUNT ALLOWED	SODIUM mg.	PROTEIN Gm.	FAT Gm.	CARBOHYDRATE Gm.	CALORIES
		Gm.					
Breakfast:	Orange juice	½ glass......100	1	1	..	11	44
	Unsalted toast	1 sl.......... 23	7	2	1	12	63
	Unsalted butter	1 tsp......... 5	...	..	4	...	36
	Unsalted oatmeal	1 serving.....100	1	2	1	11	63
	Milk	1 glass.......200	100	7	8	10	136
	Sugar	1 tbsp........ 12	...	..	..	12	48
	Coffee	....	...	..	..	...	....
			109	12	14	56	390
Lunch:	Unsalted omelet	1 egg........ 50	40	6	6	..	81
	Unsalted tomato, broiled	2 halves......100	3	1	..	4	20
	Potato, baked	1 small......100	1	2	..	23	98
	Apple and	1 small...... 90	...	..	..	14	54
	celery salad	1 stalk....... 10	11	..	..	1	4
	Unsalted mayonnaise	1 tbsp........ 13	...	..	10	..	92
	Unsalted bread	1 sl.......... 23	7	2	1	12	63
	Unsalted butter	1 tbsp........ 14	...	..	11	...	100
	Milk	1 glass.......200	100	7	8	10	136
			162	18	36	64	648
Supper:	Unsalted pot roast	Small serving. 45	22	12	10	...	139
	Unsalted carrots	1 serving.....100	31	1	..	6	30
	Unsalted onions	1 serving.....100	1	1	..	9	38
	Unsalted roast potatoes	1 serving.....100	1	2	..	19	83
	Unsalted bread	1 sl.......... 23	7	2	1	12	63
	Unsalted butter	2 tsp......... 10	...	..	8	...	72
	Grapefruit	½ medium...100	1	1	..	10	40
	Coffee	....	...	..	..	...	....
	Cream	2 tbsp........ 30	12	1	6	1	60
	Sugar	1 tbsp........ 12	...	..	..	12	48
			75	20	25	69	573
Totals for the day			346 mg. Na	50 Gm. P	75 Gm. F	189 Gm. C	1,611 Cals.

To increase the calories, fruit juices with lactose may be given between meals, and cream may be substituted for part of the milk without altering appreciably the protein or sodium content.

To decrease the calories, omit the sugar, the cream and the mayonnaise and limit the butter to 1 teaspoonful (5 Gm.) at each meal.

Food composition figures taken from individual analyses in Table 1, Part Four. Sodium figures from Table 7, Part Four.

uremia. In the terminal stages of either glomerulonephritis or nephrosclerosis, but particularly in the latter, uremia may be severe, indicating almost complete loss of kidney function. The diet should be low in protein and salt, and fluids by mouth are adjusted to the output. Again, however, the patient is critically ill and may be able to take little, if any, food by mouth. Carbonated beverages, particularly ginger ale, and fruit juices often are tolerated best. If the patient is able to eat, the diet should be bland as well as low in protein and sodium.

URINARY CALCULI

Etiology. Calculi or stones, varying in size from fine gritty particles to those which fill the pelvis of the kidney, sometimes form in either the kidney or the bladder. They are caused in part by injury to epithelial cells lining the kidney tubules and also by changes in the chemistry of the urine. The most striking example of the latter is seen in hyperparathyroidism, in which disease oversecretion of the parathyroid hormone causes loss of calcium from the bones, resulting in a high blood level of calcium with increased excretion of calcium in the urine.

Normally, the urine is slightly acid and when it becomes alkaline, either from an excess of foods rich in the alkaline elements (see Acid-Base Balance, Chap. 6) or from infection, stones composed chiefly of calcium salts of oxalates, phosphates and carbonates may occur. Uric-acid and cystine stones develop in an abnormally acid urine. The former type occurs much more frequently than the latter.

Dietary Treatment

There is some evidence that the dietary habits are important factors in calculous disease. Experimental work has shown that a diet deficient in vitamin A will produce calculi in a large percentage of animals. Urinary calculi occur much more frequently in the Old World than in the New, especially in certain parts of India and China, where the diet is known to be deficient.

Vermooten[2] observed that the South African Negro, whose diet is rich in vitamin A, low in calcium and has an acid-ash reaction, is entirely free from this disease, as judged by hospital records of over one million Negro patients.

This statement lends credence to the work of Higgins,[3] who, by careful control of the diet, not only was able to change the reaction of the urine, and thus prevent further stone formation, but also facilitated the dissolution of small stones already formed. He found that a suitable diet usually prevents recurrence, whereas stones previously were known to recur in from 15 to 20 per cent of cases operated upon for calculi. However, other clinicians,[4] do not report such favorable results. For the type of calculi found in alkaline urine, Higgins recommends a diet such as is outlined below which will change the reaction of the urine from an alkaline to an acid one, if the stones are soluble in acid, and will also improve the general conditions of the diseased organ:

[2] Vermooten, V.: J.A.M.A. **109**:858, 1937.

[3] Higgins, C. C.: J. Am. Dietet. A. 11:518, 1936.

[4] J.A.M.A. **109**:1703, 1937, **121**:566, 1943.

High-Vitamin, Acid-Ash Diet[5]

Characteristics:

1. No added salt (sodium chloride) or bicarbonate of soda.
2. Generous use of foods high in acid ash.
3. Restricted use of foods high in alkaline ash.
4. Vitamin concentrates—cod-liver and halibut-liver oils, yeast and wheat germ.

Foods Allowed:

All acid-ash foods	Meats, fish and poultry; eggs and cheese; bread, whole-wheat; cereals, preferably whole-grain; macaroni and spaghetti; prunes, plums, cranberries.
All neutral-ash foods	Sweet butter, lard, salad oils, mayonnaise; tapioca, cornstarch; sugar, candy (except chocolate); tea, coffee, Postum.
All alkaline-ash foods (except those to be avoided) in minimal amounts	Fruits, vegetables, milk (1 pint daily), cream.

To Be Avoided

Molasses, almonds, olives, spinach, beet and dandelion greens, parsnips, dried fruits and vegetables.

[5] Condensed. For full particulars see J. Am. Dietet. A. 11:518, 1936.

Typical Menu

High-Vitamin, Acid-Ash Diet

Breakfast	*Luncheon*	*Dinner*
Grapes	Veal chop	Roast beef
Oatmeal and 2 tbsp. wheat germ	Steamed rice	Potato
Scrambled eggs	Sliced tomatoes	String beans
Toast, whole-wheat, 2 sl.	Baked apple	Tapioca cream pudding
Butter, 2 squares	Whole-wheat bread, 1½ sl.	Whole-wheat bread, 1½ sl.
Milk, ½ pint	Butter, 2 squares	Butter, 2 squares
Cream, ¼ c.	Milk, 1 glass	Cream
Sugar		Sugar
Coffee		Coffee

Note: One pint of milk is to be used each day.

When calculi of the uric-acid or the cystine types occur, which happens less frequently than the type described above, the diet should be high in vitamin A but with an alkaline-ash base. To effect this, the alkaline-ash foods, especially fruits and vegetables, should predominate, while the acid-ash foods, meats, eggs and cereals, should be restricted. (See Table 8, Part Four.) There should always be sufficient protein, however, to meet normal requirements.

Water should be taken freely in order to prevent concentration of the

urine, which in turn favors precipitation of the stone-forming minerals.

STUDY QUESTIONS

1. What are the functions of the kidney? What diseases of the kidney may occur which interfere with these functions?

2. In what circumstances is protein usually restricted in the diet? What is the purpose of such restrictions? When may protein in the diet be increased? Why?

3. Why is salt usually limited in kidney disease?

4. What flavors and seasonings will make salt-poor food more palatable?

5. Why are salt substitutes containing potassium usually not allowed in nephritis?

6. Make out a menu for a day for a high-protein, salt-poor diet, using some of the recipes given in Chapter 50.

7. Add 500 calories to the low-protein, salt-poor menu in this chapter without increasing the protein or salt content.

8. Make out a menu for a day for a bland, low-protein, salt-poor semi-liquid diet for a patient critically ill with nephrosclerosis and uremia.

9. Plan an acid-ash diet for a day. An alkaline-ash diet. When are such diets used?

CHAPTER TWENTY-NINE

Diseases of the Blood

ANEMIAS
DUE TO LOSS OF BLOOD
DUE TO DEFICIENCIES
NUTRITIONAL ANEMIAS
DIETARY TREATMENT
IRON VALUES PER SERVING OF COMMON FOODS
ANEMIAS (CONT.)
DUE TO DEFICIENCIES (CONT.)
PERNICIOUS ANEMIA
DIETARY RECOMMENDATIONS FOR BLOOD DONORS
DISEASES AFFECTING THE WHITE BLOOD CELLS

GENERAL DISCUSSION

Since the blood carries the products of digestion to all tissues of the body, distributes oxygen to the cells and removes waste products, its function is vital, and any abnormal condition of it immediately interferes with the work of the body as a whole. Under certain conditions the blood plasma may have a deficiency or an excess of certain dissolved materials, but that is dependent upon other conditions in the body and will be discussed elsewhere. The red and white corpuscles and the blood platelets are the factors usually affected in diseases of the blood-forming organs.

The erythrocytes or red cells in the blood, which normally number about 5,000,000 per cu. mm. in the male and about 4,500,000 per cu. mm. in the female, are short-lived and must be renewed continually to maintain the normal number. A lack of red cells or of the red coloring matter, hemoglobin, which they carry is known as anemia. As in other tissue repair in the body, food plays a very important part in supplying the necessary materials for blood building. Unfortunately, the dietary treatment of anemias is not so simple as it at first appears, because a variety of causes other than food deficiencies are responsible for most types of anemia; consequently, diet cannot be the only factor concerned in the treatment of these conditions.

ANEMIAS

Anemia may be defined as any clinical syndrome associated with a deficiency in the quantity or the quality of the blood. However, from the point of view of the strictly nutritional aspects, Sherman[1] classifies the anemias into two outstanding types, those due to:

1. Loss of blood (hemorrhage).

[1] Sherman, H. C.: Chemistry of Food and Nutrition, New York, Macmillan, 1946.

2. Deficiency of certain substances essential to hemoglobin or red-cell formation.

Anemias Due to Loss of Blood

After hemorrhage with consequent loss in blood volume, the quantity is first restored to normal by water taken from the tissues. The thirst which often accompanies hemorrhage is the body's mechanism for demanding an increased intake of water. If necessary, some of the blood volume may be restored by transfusion. The blood must then be improved in quality by the production of more red cells and hemoglobin. In an otherwise normal individual recovery is spontaneous, but the red cells are replenished more rapidly than is hemoglobin. The latter will be restored gradually, but the speed of its restoration seems to depend largely upon the diet of the individual. The necessary food materials must be supplied in the diet in order that each of these red cells may contain the normal amount of hemoglobin.

Anemias Due to Deficiencies

This group includes the anemias caused by two types of deficiencies:

1. Deficiency in substances necessary for hemoglobin formation, such as iron and protein. These are sometimes called secondary anemias.

2. Deficiency in substances necessary for red-cell formation and the release of these cells from the bone marrow.

NUTRITIONAL ANEMIAS

Nutritional anemias are most often encountered in infancy, in adolescence, in pregnancy and in diseases which interfere with the absorption or the utilization of iron.

In Infancy. Normally the quantity of iron stored in the liver of the newborn infant is sufficient for blood building, even on the low iron diet of milk ingested for the first 3 to 4 months, although from then on foods containing iron should be included in the infant's diet. Anemia in infancy may be due to an inadequate prenatal storage of iron. This deficiency may be caused by the inadequate intake of iron-rich foods by the mother during her pregnancy, by prematurity, when there has not been time enough to lay down a storage of iron, or by the birth of twins, when the maternal supply of iron, ordinarily adequate for one infant, may not have been sufficient for two.

Later in the first year of the infant's life, if a variety of foods has not been added to his diet, anemia may occur as a dietary deficiency disease.

In Adolescence. Anemia may occur in adolescent girls for a variety of reasons. It may be associated with excessive menstruation, not compensated for by an adequate dietary intake of iron. The reducing fad of the modern girl is undoubtedly responsible for some cases of anemia, as she thus deprives herself of necessary food elements. A mild form of nutritional anemia is far more prevalent among young women than is generally supposed, and is bound to interfere with health and vigor.

In Pregnancy. If the mother's diet is not rich in iron-containing foods, a temporary state of anemia may occur owing to withdrawal of body iron by the fetus. Adequate storage

of iron in the fetus appears to depend largely on the amount of iron in the mother's diet. Anemia in either the mother or the infant will be prevented if care is taken to include a generous supply of the iron-rich foods in the diet.

Lack of Absorption. In diseases complicated by low gastric acidity, the iron in the diet may not be absorbed, because iron will remain in solution only in an acid medium. Medications, both of hydrochloric acid and iron, often are necessary to keep the hemoglobin level at normal figures, although the diet should be investigated for possible inadequacies.

Dietary Treatment of Hemorrhagic and Nutritional Anemias

An increased supply of iron and protein is the important factor to stress in a diet which must be adequate also in all other dietary essentials. Whipple[2] and his co-workers found liver, high in both iron and protein, to be at the top of the list of foods that promote blood regeneration. Other investigators have shown experimentally that diets high in iron but inadequate in protein will not promote hemoglobin regeneration.

Besides liver, which should be included at least once a week, lean meat, eggs, whole-grain and enriched bread and cereals and potatoes are common and good food sources of iron and, in the case of meat and eggs, of protein. Other foods valuable for iron content which should appear frequently in the diet are kidney, heart, green, leafy vegetables, dried fruits such as apricots, prunes and figs, the legumes and, where it is in common use, molasses. See the foregoing chart for iron content of common foods.

Medications. When it is necessary to restore the hemoglobin level promptly, iron medications as well as a diet high in protein and iron are indicated. Fortunately, most patients respond well to such a regimen.

[2] Whipple, G. H., and Robscheit-Robbins, F. S.: Am. J. Physiol. 72:408, 1925.

Iron Values per Serving of Common Foods

	Weight Gm.	Iron Mg.
Liver:		
Beef, cooked	100	7.8
Calf, raw	100	10.6
Pork, raw	100	18.0
Lamb	100	12.6
Tongue, beef	100	2.8
Heart, beef	100	4.6
Kidney, beef	100	7.9
Brains	100	3.6
Beef, lean	100	3.0
Turkey, dark meat	100	3.8
Chicken, lean	100	1.5
Oysters	100	5.6
Clams, canned	100	6.3
Egg, one	50	1.3
Lima beans, fresh	100	1.7
Navy beans, baked	100	1.8
Molasses:		
Light	50	2.1
Medium	50	3.0
Apricots, dried, cooked	100	1.4
Peaches, dried, cooked	100	1.0
Prunes, dried, cooked	100	0.9
Raisins	50	1.5
Potato	100	0.8
Mustard greens, fresh	100	2.9
Beet greens, fresh	100	3.2
Bran flakes	40	2.0
Bread:		
Whole wheat, one sl.	23	0.5
Enriched, one sl.	23	0.4

PERNICIOUS ANEMIA

Pernicious anemia differs markedly from the anemias previously discussed in that it is characterized by deficient formation of red cells. As the disease progresses the number of red blood cells decreases, while the size increases. These large cells are called macrocytes. In contrast with the nutritional anemias, pernicious anemia is associated with a disorder of the bone marrow. It is accompanied by low gastric acidity. Sometimes tingling of the hands or the feet occurs, indicating damage to the central nervous system. Normally, the red cells are formed in the red bone marrow and are not released into the blood stream until they reach a so-called mature stage, at which time they contain no nucleus. In pernicious anemia, the cells do not mature normally and they are not released in sufficient numbers from the red bone marrow, which, therefore, becomes overcrowded with these immature cells.

The cause of pernicious anemia is still thought to be the lack of a so-called intrinsic factor, a component of the gastric juice. This intrinsic factor may facilitate the use of an extrinsic factor, possibly vitamin B_{12}, to form an antianemic factor which is stored in the liver until needed by the bone marrow for the formation of red cells. Liver and liver extract, long recognized as effective therapeutic agents in pernicious anemia, are potent sources of the antianemic factor. However, vitamin B_{12} has superseded the use of liver preparations. Both the anemia and the neurologic symptoms, if present, respond promptly to this substance in most cases. Vitamin B_{12} may be the extrinsic factor, but some other factor may be essential for its utilization.

During the first few days of treatment there is a marked increase in the number of immature red cells in the blood. These cells are called reticulocytes, because when they are stained the center appears as a mesh or network. After a few days this disappears, and the cells appear as normal erythrocytes. The cell count and hemoglobin continue to increase until the normal levels are reached, and these are maintained as long as therapy is continued. Appetite and digestion also improve and may be improved further by the use of dilute hydrochloric acid with meals.

Dietary Treatment of Macrocytic Anemia. A good supply of protein and iron is as essential for this type of anemia as it is in the nutritional and the hemorrhagic anemias to provide building substances for the rapid increase in red cells and hemoglobin which occurs following the administration of vitamin B_{12}. Moreover, many patients with macrocytic anemias have a long history of a poor food intake. Therefore, the diet should be increased in vitamins and minerals in addition to iron, and be adequate in calories.

DIETARY RECOMMENDATIONS FOR BLOOD DONORS

In the past 10 years it has become increasingly common for individuals to donate a pint of blood once or twice a year, or even more frequently, to be used for hospital or Red Cross blood banks. Although there are no harmful effects if this is not repeated too often, it is wise

for such a person to adhere to a diet adequate in all nutritional respects and well supplied with iron and protein.

DISEASES AFFECTING THE WHITE BLOOD CELLS

Of the diseases affecting the white blood cells, leukemia is the most common. As in all chronic diseases, it is important to maintain good nutrition. Often this is difficult because of the patient's lack of appetite. In far-advanced disease there may be lesions in the mouth which make eating difficult and painful. Therefore, food should be soft so as not to require much chewing. It should not be heavily salted or spiced; sharp fruit juices should be omitted; and such beverages as coffee and tea should not be given to the patient too hot. Milk and milk beverages, eggs, very tender meat, fish and poultry, mashed potatoes and strained vegetables and fruits such as are sold for infants are good and usually are well tolerated.

If ACTH (adrenocorticotropic hormone) or cortisone is used in treatment, the diet may have to be low in salt, as these hormones are known to increase sodium reabsorption in the kidney. (See Chap. 27 for low-sodium diets.)

STUDY QUESTIONS

1. What are the causes of secondary anemias? Of pernicious anemia?
2. What factors should be considered in planning a diet for a patient with nutritional anemia?
3. What is the normal iron requirement for an adult woman? When is this requirement increased? Why? Why do men require less?
4. What foods supply the largest amount of iron? What common foods are good sources of iron?
5. Why is an adequate supply of protein as necessary as iron in the treatment of nutritional anemia?
6. Plan a diet that will supply 12 mg. of iron.
7. What is thought to be the relationship between vitamin B_{12}, liver extract and liver?
8. Plan a menu for a day for a patient with leukemia who has developed sore and bleeding gums, making it as adequate nutritionally and as attractive as possible.

CHAPTER THIRTY

Diseases of the Musculoskeletal and the Nervous Systems

DISEASES OF THE MUSCULOSKELETAL SYSTEM
ARTHRITIS
LEAD POISONING

DISEASES OF THE NERVOUS SYSTEM
EPILEPSY
MÉNIÈRE'S SYNDROME

DISEASES OF THE MUSCULOSKELETAL SYSTEM

ARTHRITIS

While there are other types of musculoskeletal diseases, the principal one is arthritis, sometimes called rheumatism.

Acute arthritis is any acute inflammatory process which involves the joints. Like other acute infections, an attack is of short duration but it may recur and in time become chronic. As an acute condition, it should receive much the same treatment as other acute illnesses. The diet should be planned according to the general condition of the patient. If accompanied by fever, the directions for fevers and infections (see Chap. 19) should be followed. The arthritis of rheumatic fever is a symptom and not a disease entity. The dietary treatment is that given in Chapter 19 for rheumatic fever.

Chronic arthritis usually is classified as (1) rheumatoid, infectious or atrophic and (2) osteoarthritis, static or hypertrophic.

Rheumatoid arthritis occurs more frequently than the hypertrophic form, and usually starts in early adult life. Women are much more susceptible to it than men. This type is sometimes called chronic infectious arthritis because infections were thought to be a common cause of the ailment, but leading medical authorities now are agreed that there is, as yet, no known cause of this disease. Although the cause is as yet undetermined, two hormones, cortisone, obtained from the cortex or outer portion of the adrenal glands, and adrenocorticotropic hormone, known also as ACTH, may give marked relief. The latter hormone, produced by the pituitary, stimulates the adrenal gland. Both hormones are very effective in relieving patients of their crippling and painful rheumatic symptoms. That these hormones do not cure the disease is shown by the prompt

return of symptoms when the medication is withdrawn. Therefore, these patients must continue to take small doses of one or the other hormone.

Dietary Treatment

Many dietary regimens have been advocated, such as the low-carbohydrate diet and the low-caloric diet. A high dosage of vitamin D also has had its day, but after much trial and effort, the consensus is that optimal nutrition is of the utmost importance. If the appetite of the patient will permit the taking of an adequate diet, supplements should not be required.

The caloric allowance should be adjusted to the condition of the patient: if underweight and malnourished, as many are, a high caloric, high-vitamin diet is indicated. If the patient is overweight, a low caloric diet usually is recommended as a means of relieving pressure on the involved joints. (See Chap. 18.)

The protein should meet the standard requirement for the individual. Fruits, vegetables and whole-grain or enriched breads and cereals should constitute an important part of the diet. The selection of foods should be such as to afford optimal intake of all minerals and vitamins.

Osteo-arthritis usually occurs in persons beyond middle life and, like rheumatoid arthritis, is found more frequently in women than in men. These patients often present a healthy appearance, although they are usually overweight and have bad posture. Constipation and arteriosclerosis are frequent complications. Therefore, it is thought to be a natural accompaniment of old age. It is known that overweight puts a strain upon the weight-bearing joints, such as ankles and knees, hence it is important that the dietary treatment should be directed toward attaining a normal weight (see Chap. 18).

Gout may produce a condition resembling arthritis which results sometimes in a permanent deformity or a crippling of the joints. For further information see Chapter 31.

Lead Poisoning

Lead may enter the body through the gastro-intestinal tract when mixed with food or drink; through the skin when cosmetics and hair dyes containing lead are used; and through the respiratory system when lead dust is inhaled. Exposure to powdered lead in the manufacture of paint, rubber and other products constitutes one of the greatest industrial hazards, and masks are usually worn by workmen exposed to lead fumes. Absorption through the skin is negligible. Most of the lead which enters the blood stream is stored finally in the bones, where it is harmless. It is only when relatively large quantities of lead are circulating in the blood that severe toxic symptoms occur. These are vomiting, colic, weakness and collapse.

Dietary Treatment

During the acute stage, the remedy consists of injections of calcium lactate solution and a diet high in calcium containing from 1 to 2 quarts of milk. The increased calcium intake favors the deposit of lead in the bones, where, as has been said, it does not seem to be harmful. After the acute symptoms abate the patient may be placed on a low-calcium diet to tease the lead gradually out

of the bones and to excrete it from the kidneys. Since there is danger of precipitating another lead crisis by doing this, most physicians prefer to keep the lead in the bones and to maintain the patient on a high-calcium diet.

DISEASES OF THE NERVOUS SYSTEM

Although there are numerous diseases of the nervous system, not much importance has been attached to the diet as a causative factor. It is true, however, that much greater effort is now being made to supply a thoroughly adequate and palatable diet for those in hospitals and institutions for mental and nervous diseases.

Some research as to dietary factors has been reported by Miller,[1] of St. Elizabeth's Hospital, Washington, D. C. Observations were made on 20 patients, all suffering from insomnia, anxiety, nervous tension and emotional lability. They were placed on a restricted salt regimen of 2 Gm. of sodium chloride per day. It was found that a satisfactory level of chloride excretion was attained after from 7 to 15 days, when the sodium chloride could be increased to from 3 to 4 Gm. daily.

The usual results of the restricted salt regimen were (1) pronounced or moderate relief from tension and insomnia and (2) lowered blood pressure and pulse rate. Therefore, Miller recommends a low-sodium chloride diet (known also as a low-sodium diet, see Chap. 27) as an important adjunct to psychotherapeutic measures in the treatment of insomnia and tension states. (See also Table 7, Part Four.)

Epilepsy

Epilepsy is a disorder which has afflicted mankind for many centuries. Hippocrates and other ancient writers described it in their writings, some believing that it was caused by evil spirits. It is more often a disease of childhood and adolescence, but about one fourth of the known patients are adults. McLester[2] describes it as a "manifestation of a variety of lesions of the central nervous system. Heredity plays a part but probably only to the extent of providing the patient with nerve structures which are more sensitive to irritation than are those of other persons."

Its chief symptom may be momentary loss of consciousness, called petit mal attacks, which may hardly be noticed; or the symptoms may be more severe, with accompanying convulsions. Contrary to popular belief, epilepsy does not cause mental deterioration except in a small percentage of cases. Most children can carry a normal level of schoolwork and some are far above average in intelligence. Both children and adults should be helped to lead lives as near normal as possible, as tension increases the number and the severity of seizures.

Treatment

Various therapies have been tried in the treatment of this condition. At the present time such drugs as phenobarbital and dilantin sodium

[1] Miller, M. M.: J.A.M.A. **129**:262, 1945.

[2] McLester, J. S., and Darby, W. J.: Nutrition and Diet in Health and Disease, ed. 6, Philadelphia, Saunders, 1952.

are the most effective means of controlling the seizures. In most instances this method of treatment has replaced other types of therapy. For some years the ketogenic diet was used widely in the treatment of epilepsy, especially for young children. With the advent of effective drug therapy the main use of the diet is for those who do not tolerate drugs well. Therefore, the majority of epileptic patients are advised, along with the drug therapy of choice, to eat a diet that will supply them with all the requirements of normal nutrition for their age and activity. They may be advised to restrict the fluid intake somewhat, since dehydration is thought by some to be helpful in controlling seizures. Alcoholic beverages, which are known to cause attacks, are prohibited. Other than that there need be no modification of the food requirements.

Ketogenic Diet

In the event that a ketogenic diet is ordered, with or without drug therapy, the following paragraphs give the characteristics of the diet and illustrate the method of calculating it.

The ketogenic diet is very low in carbohydrate, very high in fat, moderate to low in protein and adequate in calories. It is intended to produce a state of ketosis, which, if maintained continuously, may be effective in reducing the attacks. The ketogenic diet is difficult to follow, since the high-fat, low-carbohydrate intake does not lend much variety, and the large amounts of fat are often distasteful. It is an expensive diet as well and calls for patience and cooperation on the part of the family and the patient if it is to be effective. The diet must be adhered to for a period of from one to several years.

To determine the order for a ketogenic diet for a child, the patient's caloric needs are calculated on the basis of 55 calories per kilogram of body weight. Protein is given on the basis of 1 gram per kilogram of body weight, even for children, because of its high potential glucose content. The distribution of fat and carbohydrate in the diet is such that a ketogenic/antiketogenic ratio of 3:1 is maintained. This is done by calculating the ketogenic properties of the diet as 42 per cent of the protein and 90 per cent of the fat; and the antiketogenic properties of the diet as 58 per cent of the protein, 10 per cent of the fat and 100 per cent of the carbohydrate.[3] As an example, a child of 7 to 9 years may be given a diet of 40 grams protein, 189 grams fat and 20 grams carbohydrate. (See p. 388.) The K/AK ratio would be calculated as follows:

Ketogenic

	Gram Ketones
42% of 40 Gm. protein	= 16.8
90% of 189 Gm. fat	= 170.1
	186.9

Antiketogenic

	Gram Glucose
58% of 40 Gm. protein	= 23.2
10% of 189 Gm. fat	= 18.9
100% of 20 Gm. COH	= 20.0
	62.1

It will be seen that the ratio of ketogenic to antiketogenic substances is 186.9:62.1 or approximately 3:1.

[3] Mayo Clinic Diet Manual, Philadelphia, Saunders, 1949.

The diet usually is initiated by a gradual lowering of the carbohydrate content and a corresponding increase in the fat content for a period of four days; or by a period of starvation for the same length of time. The ketogenic diet is then begun and, as has been said, must be adhered to faithfully for a period of a year or years.

Foods Permitted, Restricted and to Be Avoided on Ketogenic Diet

Characteristics:

1. It is usually a weighed diet.
2. It is calculated for each individual.
3. It is low or adequate in protein.
4. It is adequate in calories to maintain weight in adults and growth in children.
5. It has a high ratio of fatty acids to glucose, which varies with the ease with which ketosis is attained and the intensity of the ketosis desired.

Foods Used Freely:

Fats	40% cream, butter, margarine, salad oils, bacon, bacon fat, chicken fat.
Cheese	All high fat cheeses.
Eggs	Cooked in all ways.
Meat, fish and fowl	All kinds, especially fatty meats. Must be prepared without flour or bread crumbs.
Vegetables	3% carbohydrate only.

Foods Allowed in Limited Amounts:

Milk	If allowed.
Bread Substitutes	Soybean preparations and gluten preparations of low starch content.
Vegetables	6% carbohydrate.
Fruits	3%, 6% and 9% carbohydrate.

Foods to Be Avoided:

Bread, cereal and Italian pastes	All.
Vegetables	9% and higher.
Fruits	12% and higher; dried fruits.
Desserts	Pastries, pies, cakes, cookies, ice cream, puddings and all other sweetened desserts.
Sweets	Sugar, candy, chewing gum, honey, jelly, jams, preserves, sweetened fruit.
Beverages	All containing sugar such as sodas and ginger ale.

Supplements:

Vitamin concentrates and some form of calcium are usually necessary to keep the diet from being inadequate in these substances.

KETOGENIC DIET FOR A CHILD 7 TO 9 YEARS OF AGE
1,950 Calories; 40 Gm. Protein

Food	Calculation (Protein, 40 Gm.; Fat, 189 Gm.; Carbohydrate, 20 Gm.)			
	Amount Gm.	Protein Gm.	Fat Gm.	Carbohydrate Gm.
Breakfast				
Fruit, 6% (or vegetable juice 100)	50	1	..	3
Cream, 40%	100	2	35	3
Butter or margarine	20	..	16	..
Egg, 1	50	6	6	..
Bacon with fat	20	2	13	..
Bran soya muffin, 1	...	2	3	..
Dinner				
Roast beef (med. fat)	30	7	7	..
Vegetable, 3%	100	2	..	3
Fruit, 6%	50	1	..	3
Cream, 40%	50	1	18	1
Butter or margarine	25	..	20	..
Bran soya muffin, 1	...	2	3	..
Supper				
American cheese	30	8	10	1
Vegetable, 3%	100	2	..	3
Cream, 40%	100	2	35	3
Butter or margarine	25	..	20	..
Bran soya muffin, 1	...	2	3	..
Total	...	40	189	20

MÉNIÈRE'S SYNDROME

Ménière's syndrome comprises a group of symptoms which include dizziness and gastro-intestinal disturbances associated with unilateral defects in hearing and in equilibrium. This syndrome is thought to be due to a swelling of the vestibular apparatus of the ear caused by an allergic response or by a spasm of the blood vessels within the ear. It has also been attributed to sodium retention.

Treatment

Dietary treatment is based on abstinence from foods to which the patient is sensitive or a salt-poor acid-ash diet and ammonium chloride as advocated by Furstenberg.[4] Some cases respond also to vitamin therapy. Atkinson[5] advises a high-protein, high-vitamin diet with the addition of niacin in the acid form, largely for its effect as a vasodilator. For elderly people he advises another factor of the B complex, thiamine, as it is milder in its effects on the blood vessels. Because Ménière's syn-

[4] Furstenberg, A. C., *et al.*: Ann. Otol., Rhin. & Laryng. 43:1035, 1934.
[5] Atkinson, M.: J.A.M.A. **116**:1753, 1941.

drome or disease is a vasospastic condition, he also states that smoking should be forbidden.

STUDY QUESTIONS

1. Make out a menu for a high-caloric diet for a patient with rheumatoid arthritis who has a poor appetite.

2. Make some suggestions for losing weight to a patient with osteoarthritis who is overweight and inactive because of the disease.

3. What is the principle of using a high-calcium diet for the treatment of lead poisoning? What food should be forced?

4. What is the accepted treatment for epilepsy at the present time? What role should diet play in its treatment? What is the ketogenic diet? When may it be used?

5. Calculate the K/AK ratio of a diet containing 50 Gm. protein, 180 Gm. fat and 30 Gm. carbohydrate.

6. What type of diet has been advocated in treating Ménière's syndrome? Why?

Miscellaneous Metabolic Disturbances

SPONTANEOUS HYPOGLYCEMIA
HYPERTHYROIDISM
HYPOTHYROIDISM
ADDISON'S DISEASE
GOUT
PURINE CONTENT OF FOODS
TETANY

SPONTANEOUS HYPOGLYCEMIA

Etiology. Spontaneous hypoglycemia is not a clinical entity in itself but a disturbance of the carbohydrate metabolism which may be caused by a number of seemingly unrelated factors involving the liver, the pancreas and other organs of the endocrine system, as well as the nervous system. One of the chief causes, however, is known to be hyperinsulinism, which is a metabolic disturbance in which the pancreas is involved. Its effects are the opposite of those seen in diabetes mellitus. Another main cause is a tumor of the pancreas.

Symptoms. The symptoms are almost identical to those produced by overdoses of insulin in the treatment of diabetes mellitus.

Hypoglycemia, or low blood sugar, is accompanied by attacks of weakness, trembling and sweating which occur before breakfast and 1 to 2 hours before the midday and the evening meals, also before retiring and frequently during the night. In severe cases there may be unconsciousness, convulsions and hysterical symptoms. This disease is characterized by extreme hunger—indeed, it is often known as the hunger disease. Abdominal discomfort, which is also characteristic, is relieved by taking food and, because of this similarity to peptic ulcer, it is sometimes mistaken for that condition.

Dietary Treatment

A carefully planned and regulated dietary regimen is quite as important in hyperinsulinism as in diabetes mellitus, where hypoinsulinism is the causative factor. Since the objective of treatment is to supply the body with sources of glucose in as continuous a flow as possible, the slower-acting nutrients, protein and fats seem to be the most effective. For this reason Conn[1] and others[2] rec-

[1] Conn, J. W.: J. Clin. Investigation 5:673, 1936; J.A.M.A. **115**:1669, 1940.
[2] Beeuwkes, A. M.: J. Am. Dietet. A. 18:731, 1942.

ommend a high-protein (120 to 140 Gm.), low-carbohydrate diet (50 to 75 Gm.) with liberal amounts of fat (175 Gm. or more) sufficient to make up the calories. The basis for restriction of the carbohydrate is the fact that carbohydrate stimulates the islet cells to further insulin production.

The patient's nutritional needs should be calculated in each case. The adult patient of average height and weight, with hyperinsulinism, should have about 2,250 calories. The food intake is best divided into from 5 to 8 feedings a day.

HYPERTHYROIDISM

Etiology. Hyperthyroidism, as the name would indicate, is a condition characterized by an excessive secretion of the thyroid gland. It is known also as thyrotoxicosis, goiter, Graves' disease or Basedow's disease. The chief symptoms are bulging eyes, nervous irritability, fatigue, weakness, rapid pulse, loss of weight and a high metabolic rate. The high metabolic rate, of course, accounts for the loss of weight, for it will be remembered that the thyroid gland through its internal secretion is probably the chief regulator of energy metabolism. The rate of metabolism is increased from 15 per cent above normal in mild cases to 75 per cent or more in severe cases. When the metabolic rate is excessive, not only are the nutrients in the body burned too rapidly, but even the tissues are drawn upon as a source of additional fuel.

Treatment consists of suppression of the production of thyroxin by drugs or by radioactive iodine; or by excision of the gland.

Dietary Treatment. It is important meanwhile that additional food should be supplied and that the patient should rest to prevent unnecessary expenditure of energy. When the metabolic rate is excessive, it may be necessary to increase the food supply to from 4,000 to 5,000 calories. The high caloric diet (see Chap. 18) is therefore indicated until normal weight has been reached and the basal metabolic rate has returned to normal levels.

Milk should be taken in generous amounts, not only for its caloric values but for its calcium. Indeed, it is believed wise to increase both calcium and phosphorus, as well as the vitamin content of the diet, especially thiamine, the store of which is believed to be exhausted quickly because of the increased metabolism. All stimulants such as coffee, tea, alcohol and tobacco are limited or omitted, depending on the doctor's orders.

HYPOTHYROIDISM

Hypothyroidism is marked by a deficient secretion of the thyroid gland. It is also known in its advanced stage as myxedema. It is characterized by a low metabolic rate, ranging from minus 15 per cent to minus 30 per cent or more, and may be said to be the antithesis of hyperthyroidism. Because of the low metabolic rate these patients gain weight rapidly. The treatment for this condition consists of medication in the form of desiccated thyroid and the regulation of the diet, which should be a low-caloric diet such as is described in Chapter 18. This condition may be related to iodine deficiency. (See Chaps. 6 and 20.)

ADDISON'S DISEASE

Etiology and Symptoms. Addison's disease is rare and the prognosis grave, although newer methods of treatment make the possibilities of control more hopeful. It is characterized by a bronze discoloration of the skin, severe prostration, progressive anemia, low blood pressure, dehydration, nausea, diarrhea and digestive disturbances. The disease is due to impairment or destruction of the cortex of the suprarenal (adrenal) glands, caused chiefly by tuberculosis and atrophy. The hormones of the suprarenal cortex control sodium reabsorption in the kidney tubule and have an effect on carbohydrate metabolism and the blood pressure.

Loeb and Atchley[3] have demonstrated that the sodium content of the blood of patients suffering from Addison's disease is greatly decreased. Adrenalectomized dogs or cats show similar symptoms, owing to loss of sodium through the kidneys. Life has been prolonged in such animals by the injection of salt solutions. The administration of NaCl in typical cases of Addison's disease is reported by Loeb to have been followed by relief from the more distressing symptoms and marked decrease in exhaustion. It is believed that the NaCl furnished the necessary sodium to replace the excessive loss from the blood and tissues with equivalent loss of fluid. Potassium is found in the blood in abnormally large amounts.

[3] Loeb, R. F., and Atchley, D. W.: M. Clin. North America 17:1317-23, 1934; P.S.E.B. & M. 30:808, 1933. Loeb, R. F.: Bull. N. Y. Acad. Med. 16:347, 1940, and 18:263, 1942.

Treatment. With the production of cortical extracts and desoxycorticosterone acetate the therapy of Addison's disease has become much simpler. Where formerly a low-potassium diet, which is difficult of preparation, was used, the treatment now consists of administration of either the cortical extract or desoxycorticosterone acetate, sufficient amounts of sodium chloride, water and an adequate diet.

The cortical extracts are given intramuscularly. The desoxycorticosterone may be administered in the same way or by pellets implanted under the skin. The latter are not as expensive as the extracts and they are now used when obtainable in preference to the extracts.

Salt therapy[4] is usually combined with the cortical extract. The diet should contain more sodium chloride than that usually used in the preparation of the food. In addition, tablets or capsules containing salt may be given along with the meals. The salt has a sparing action on the hormonal needs and thus decreases the expense of the treatment.

The diet should meet all the requirements of adequate nutrition. Since there is a tendency to hypoglycemia in Addison's disease, it is advisable to have the diet high in carbohydrate. It should be served in frequent feedings and include a late evening nourishment.

The protein should be at least normal, and it is recommended by some that an allowance of 1½ to 2 Gm. per kilo be given. This is especially important if the patient, be-

[4] Thorn, G. W., *in* Cecil and Loeb's Textbook of Medicine, ed. 8, Philadelphia, Saunders, 1951.

cause of digestive disturbances, can tolerate fats only in limited amounts.

The appetite of the patient with Addison's disease is fickle, and with the accompanying gastro-intestinal disturbances it requires much catering to the desires of the patient in order to maintain sufficient food intake. Attractive palatable meals are extremely important.

GOUT

Etiology and Symptoms. Gout is another metabolic disorder, closely related to arthritis. It is characterized by acute attacks of so-called gouty arthritis which may last for days or weeks, during which time certain joints, especially of the great toe and of the hands (see Figs. 70 and 71), become swollen and inflamed. Tophi, which are small accretions of uric acid in the soft tissues, are also likely to appear. Pain accompanies these attacks. After a limited time the attack may disappear entirely until another occurs.

The cause of this disease is not definitely known, although it is generally conceded to be a disturbance of the purine metabolism, the purines being formed in the breakdown of the nucleoproteins of food. Purines may be produced within the tissues of the body or they may enter the body through foods in which they normally occur. Uric acid is the end product of purine metabolism. It is found in the blood and the tissues, as it accumulates in much the same

Fig. 70. Acute gouty arthritis of great toe. (Cecil and Loeb: Textbook of Medicine, ed. 8. Philadelphia, Saunders)

FIG. 71. Bones of the hand of a normal person (*left*) and of one with far-advanced gout (*right*), showing marked skeletal changes. (The Department of Radiology, The New York Hospital)

way that glucose does in diabetes, although in gout there are actual deposits of sodium urate, a compound of uric acid, in and about the joints and in the tophi.

During the attacks of acute pain the uric acid of the urine usually is increased, although at other times the uric acid of the blood only is increased. Deficient elimination is a contributing factor; hence, the free use of water and other fluids is recommended. Markedly beneficial effects have been obtained in this disease, as in many others, by the use of ACTH (adrenocorticotropic hormone) and cortisone.

DIETARY TREATMENT

The diet is still an important aspect of treatment. If the gouty patient is overweight, it is of prime importance that the diet be made low in calories until normal weight is attained. Since purine metabolism is disturbed, it is obvious that foods rich in these substances should be used sparingly. Meats of all kinds contain purines, but sweetbreads and other glandular organs, such as liver, contain large quantities.

The chart entitled "Purine Content of Certain Foods" classifies the principal foods into four groups according to purine content. The foods in List 1 contain very large amounts, while those in List 4 contain an insignificant amount of purine or none. It is apparent therefore that List 4 contains the foods of choice for a low-purine diet.

The diet to be prescribed will depend upon the condition of the patient at the time he is seen by the

physician. If the patient is having an acute attack of gouty arthritis, as described above, a purine-free or at least a low-purine diet undoubtedly will be prescribed. Eggs, milk and cheese will be the chief sources of proteins. The diet is usually low in fat, as fat is thought to prevent the normal excretion of urates (salts of uric acid). Tests have shown that high-fat and low-carbohydrate diets may precipitate an attack in gouty patients. Since the diet is low in fat and restricted to dairy products, the caloric value can be maintained only by including foods of high carbohydrate value. If, however, the patient is obese, a low-caloric diet is indicated. The diet must also consist of foods that are digested easily and must be prepared without seasonings, except salt. Sometimes tea, coffee, chocolate and condiments are prohibited, but Hench[5] states that "coffee and tea are permissible, being methylated purines which do not form uric acid." He also states that "complete abstinence from alcohol is advisable."

Recovery from the acute gouty attacks may occur within a few days or longer. Usually, the patient is kept on a moderately low-purine diet in the hope that recurrent attacks may be averted.

Interval Diet. Hench[6] summarizes the interval treatment as related to the diet as follows:

> Each patient must be treated individually as the stage and severity of his disease and his temperament dictate. In general, the diet should be free of purines on two, not necessarily consecutive, days and low in purines five days a week. Normal diets contain 600 to 1,000 mg. of purines daily; a low purine diet contains 100 to 150 mg., and can be attained roughly by allowing one food from List 2 one day a week, and one from List 3 four days a week, besides whatever foods are desired from List 4. Normal weight should be maintained and obesity avoided. Two days weekly the selections should be only from List 4. Foods in List 1 should always be avoided entirely, also spices, condiments and rich or indigestible foods and sauces. Deficiencies in protein, iron and vitamin B must be avoided. Generally, the diet should be reinforced with an approved preparation of the vitamin B complex.

A more liberal intake is advised by Talbott,[7] who says: "Recently accumulated evidence suggests that any nitrogenous product may be a precursor of uric acid. Until this evidence is confirmed and its significance properly understood, it is permissible to allow patients animal proteins daily."

PURINE CONTENT
OF CERTAIN FOODS[8]

LIST 1

Foods which contain very large amounts (150 to 1,000 mg.) of purine bodies in 100 Gm.:

Sweetbreads	825 mg.
Anchovies	363 mg.
Sardines (in oil)	295 mg.
Liver (calf, beef)	233 mg.
Kidneys (beef)	200 mg.
Brains	195 mg.
Meat extracts	160–400 mg.
Gravies	variable

[5] Hench, Philip S., *in* Cecil and Loeb's Textbook of Medicine, ed. 8, Philadelphia, Saunders, 1951.

[6] *Ibid.*

[7] Talbott, J. H.: Am. J. Nursing **50**: 731, 1950.

[8] Hench, P. S.: J.A.M.A. **116**:453, 1941.

LIST 2

Foods which contain a large amount (75 to 150 mg.) of purine bodies in 100 Gm.:

Bacon	Pheasant
Beef	Pigeon
Calf tongue	Pike
Carp	Plaice
Chicken soup	Pork
Codfish	Quail
Duck	Rabbit
Goose	Sheep
Halibut	Shellfish
Lentils	Squab
Liver sausage	Trout
Meat soups	Turkey
Partridge	Veal
Perch	Venison

LIST 3

Foods which contain a moderate amount (up to 75 mg.) of purine bodies in 100 Gm.:

Asparagus	Mushrooms
Bluefish	Mutton
Bouillon	Navy beans
Cauliflower	Oatmeal
Chicken	Oysters
Crab	Peas
Eel	Salmon
Finnan haddie	Shad
Ham	Spinach
Herring	Tripe
Kidney beans	Tuna fish
Lima beans	Whitefish
Lobster	

All whole-grain bread and breadstuffs, and all whole-grain cereals, including wheat germ and bran.

LIST 4

Foods which contain an insignificant amount of purine or no purine:

Beverages:

Carbonated	Fruit juices
Chocolate	Postum
Cocoa	Tea
Coffee	

Butter*

Breads—White bread and crackers, corn bread

Caviar

Cereals and cereal products:

Corn	Refined wheat
Rice	Macaroni
Tapioca	Noodles, etc.

Cheese of all kinds*

Eggs

Fats of all kinds (but in moderation)

Fruits of all kinds

Gelatin

Milk, buttermilk, evaporated, condensed, malted milk

Nuts of all kinds*

Peanut butter*

Pies* (except mince-meat)

Shad roe

Sugar and sweets

Vegetables:

Artichokes	Lettuce
Beets	Okra
Beet greens	Parsnips
Broccoli	Potato:
Brussels sprouts	Sweet
Cabbage	White
Carrots	Pumpkin
Celery	Rutabagas
Corn	Sauerkraut
Cucumber	String beans
Dandelion greens	Summer squash
Eggplant	Swiss chard
Endive	Tomato
Kohlrabi	Turnips

* These foods are high in fat.

NOTE: To calculate the purines or purine bodies in a given food the purine nitrogen is multiplied by 3. Example: 200 mg. of purine nitrogen equals 600 mg. of purine bodies.

TETANY

Etiology. Tetany, otherwise known as spasmophilia, is a term applied to a disturbance of muscular function characterized by convulsions or other

muscular spasms. It occurs much more frequently in children than in adults, although it is not uncommon in pregnancy. Sometimes the cause is due to hypoparathyroidism. It frequently occurs when some of the parathyroid glands have been removed by thyroidectomy, although there may be other causes, the exact nature of which is not always known. It is associated with disturbances of mineral metabolism, characterized usually by one of two abnormalities: (1) hypocalcemia (low blood calcium), or (2) alkalosis.

Hypocalcemia may be due not only to an endocrine disturbance but to a deficiency of the food intake or to a loss of calcium such as occurs in pregnancy, in osteomalacia and in fatty diarrhea. The food deficiency may be due to lack of calcium in the diet, to inability to absorb calcium or to a nonutilization of it, caused by vitamin D deficiency. The treatment, therefore, consists of large quantities of milk to provide calcium and such measures as will increase the absorption and the utilization of calcium, such as exposure to sunlight or ultraviolet light and the administration of vitamin D in the form of viosterol or certain fish-liver oils. Calcium salts also may be administered to increase this mineral in the blood.

Tetany due to alkalosis may be caused by an excessive intake of base-forming or alkaline compounds, such as sodium bicarbonate, or by losses of the acids such as hydrochloric acid occasioned by prolonged vomiting. When tetany occurs from alkalosis, the treatment consists of the administration of acid therapy such as hydrochloric acid and other measures which will restore the acid-base balance of the body.

STUDY QUESTIONS

1. Plan a day's menu for a patient with hyperinsulinism. He is on a diet of 100 Gm. protein, 160 Gm. fat and 50 Gm. carbohydrate.

2. A patient with hyperthyroidism has a basal metabolic rate of plus 50. What does this mean? What type of diet will be prescribed for him? Name five ways of increasing calories in the normal diet.

3. Why is a low-caloric diet indicated in hypothyroidism? Name five ways in which to decrease the calories in the ordinary diet.

4. What changes in metabolism occur in Addison's disease? Why is salt intake increased in this disease?

5. A man has gout and is having an acute attack.

(a) Plan an adequate menu for a day from the foods given under List 4, low in purines.

(b) Plan a week's menu which he may follow as an interval diet after his recovery from the acute attack. Use Hench's plan for a low-purine diet.

(c) What foods should he avoid entirely?

(d) What measures may have to be taken to ensure the adequacy of a low-purine diet?

6. What are the causes of tetany? How is it treated?

Preoperative and Postoperative Diets

PREOPERATIVE DIETS
SYMPTOMS REQUIRING ATTENTION
POSTOPERATIVE DIETS
SPECIAL ROUTINES FOR GASTRO-INTESTINAL-TRACT OPERATIONS
POSTOPERATIVE DIETS (CONT.)
TONSILLECTOMY DIET
RADICAL SURGERY OF THE MOUTH AND THE THROAT
TUBE FEEDINGS
BURNS

PREOPERATIVE DIETS

The type of preoperative treatment given will depend upon the type of operation, whether minor or major, and the time interval before the operation. Emergency operations do not permit of preliminary dietary treatment, even though the patient may have a serious complication, such as diabetes. Where there is no emergency, however, the patient is prepared and put in the best possible condition for the operation, especially if the operation is to be a major one.

The dietary treatment of the patient in preparation for an operation depends on his condition. This is determined by physical examination and various clinical tests. For so-called subclinical deficiencies a dietary history may prove to be of value. The conditions that may have to be combated in diseases requiring major surgery are listed below.

Symptoms Requiring Attention

1. **Loss of Weight, Strength and Recuperative Power.** Every effort should be made in such patients to increase the intake of nutritious and easily digestible foods, such as milk or milk and cream, eggs, fruit juices fortified with lactose, high-protein beverages and as much other food as the patient can tolerate without discomfort.

2. **Dehydration,** or loss of body fluids. This condition may exist if there has been vomiting, diarrhea or loss of weight. The remedy consists of filling up the reservoirs of the tissues with fluids—by mouth and, in severe cases, by intravenous infusions. In dehydration there may also be loss of salts from the tissues. Body chlorides are lost through vomiting, and sodium is then excreted via the kidney. To remedy this condition sodium chloride may be given with glucose intravenously.

3. **Loss of glycogen** from the body stores: the liver and muscular tissues. To correct this condition carbohydrates should be given abundantly. Fruit juices, glucose, corn sirup and hard candies are excellent sources. Glucose may be given intravenously.

4. **Hypoproteinemia,** or depletion of serum protein. A high-protein, high-carbohydrate diet and transfusions of blood or plasma are given in preparation for surgery.

5. **Edema** or retention of body fluid in the tissues. If it is the result of low serum proteins, it is treated as above. Cardiac edema will be treated with a salt-poor diet and appropriate diuretics and cardiac drugs.

6. **Anemia.** This frequently occurs where there are hemorrhagic lesions. Foods high in iron may be given, but time seldom permits the restoration of hemoglobin by this means of therapy. Usually, blood transfusions are given to these patients.

7. **Vitamin Deficiency States.** These may occur in patients who have had difficulty eating an adequate diet for some time before they came to the attention of the doctor. Thiamine and other vitamins of the B complex are given in foods, in brewer's yeast or as concentrates. Vitamin K is given when hypoprothrombinemia is present, as indicated by blood test. Ascorbic acid facilitates the healing process, and vitamin A is thought to build up resistance of the epithelial tissues to degenerative changes.

8. **Retention of urea** and other nonprotein nitrogen products in the blood, due to impaired renal function. This may be treated with diuretics. Sometimes glucose is administered intravenously, since it also may act as a diuretic.

9. **Ketosis.** This may exist, due to lack of food and to the burning of body fats. The treatment for this condition is to increase the carbohydrate intake, either by mouth or intravenously.

General Considerations

Surgeons are emphasizing the importance of preoperative feeding as an important part of the preparation of the patient for surgery.

From the foregoing outline it is evident that the dietary treatment in preoperative conditions must be given careful consideration. If any one of the conditions already mentioned exists, it should be treated before the patient is brought to operation (except in emergencies), otherwise complications may result.

Improving the state of the patient's nutrition to withstand the shock of operation is another important consideration.

Carbohydrate should be forced, not only because a liver well stocked with glycogen for energy is necessary, but because it has protective value against liver damage by anesthesia.

Protein is necessary in large amounts, especially when hypoproteinemia and edema exist. It has been found more effective even than carbohydrate in the prevention of liver damage due to the toxic effects of the anesthetic. This is particularly important in diseases of the liver.

Fluid balance should be maintained. No patient should go to operation in a dehydrated state.

Special preoperative procedures may be necessary for certain conditions. For instance, if there is to be an operation on the large intestine or the rectum, a low-residue diet will

be necessary for several days preceding the operation. Diabetics must be well controlled before elective surgery is undertaken. Patients with hyperthyroidism should be gaining weight before operation is performed.

Holman[1] summarizes the needs as follows:

> Surgical patients should, whenever possible, be prepared for operation by several days of optimum nutrition, including a well-balanced diet of high protein intake, of high caloric value and of high vitamin content. This period should begin at home 10 to 14 days before operation. . . . This preparation should also include vitamin concentrates for 5 to 7 days before operation.

All food is withheld just prior to the operation, however, as undigested food in the gastro-intestinal tract would cause serious difficulties. The length of time for the withholding of food depends upon the type of operation. In preparation for minor surgery no food is allowed on the day of the operation, unless the operation is delayed until the afternoon, in which case a light breakfast of cereal, toast, coffee and fruit juices may be given.

For abdominal operations, a clear or full fluid diet may be ordered for 2 or 3 days preceding the operation in order to have the gastro-intestinal tract as clear of partially digested food as possible. Usually, no food or fluid is allowed after midnight of the day before operation.

POSTOPERATIVE DIETS

General Considerations

The state of nutrition of the patient following operation must be maintained, but owing to the toxicity of the anesthetic, nausea is likely to occur. The need for calories is of prime importance, since the glycogen supply will have been depleted. Glucose given intravenously supplies this. Of even greater importance may be the need for protein, since it is essential for the healing of wounds. Blood transfusions to supply serum proteins as well as to counteract blood loss are a routine procedure immediately following major operations. Protein hydrolysates may be given intravenously, especially in situations where the amount of food taken by mouth is limited.

The maintenance of fluid balance is also important. The normal avenues of fluid intake by beverage, food and metabolism of food are greatly decreased because of the inability to take anything by mouth. The usual avenues of excretion continue and may even be increased by vomiting, hemorrhage and exudation. Therefore, the intravenous use of fluids is extremely important. Usually they are given immediately after the operation to prevent dehydration and shock.

Maintenance of salt balance is equally necessary. Salts may be lost by the same routes by which fluid is lost. The use of physiologic saline is indicated to help in replacement of the lost salts. Since fluids, salt and carbohydrate are all necessary for the immediate needs of the postoperative patient, they may be given in one solution.

Food by Mouth. Except in operations on the gastro-intestinal tract, the first thing given by mouth is water in sips as soon as the nausea stops. If preferred, bits of ice may be held in the mouth; this supplies

[1] Holman, Emele: Surg., Gynec. & Obst. 70:261, 1940.

small amounts of water. If the sips of water do not cause vomiting, other liquids, such as tea with sugar, ginger ale and broth, are added next.

From this stage the patient will progress to a full-liquid, a soft and finally to a general house diet. (See Chap. 17.) With the early ambulation for surgical patients in vogue at the present time, there is a much more rapid recovery from the postoperative state and therefore a rapid increase in the diet. It is not uncommon for a patient to be on a general diet by the second postoperative day. The great advantage of this rapid progression in dietary intake is that there is little loss in the nutritional state of the patient and therefore less need for expensive transfusions or unpleasant infusions.

Special Routines for Gastro-intestinal-Tract Operations

The dietary treatment following operation on the gastro-intestinal tract will require careful planning. There has been handling of the organs during the operation, and usually the operative area is within the tract itself. The principles of the diet, therefore, are that it be nonstimulating and nonirritating while gradually the tract again becomes able to perform its digestive functions.

A return to the normal diet is the ultimate aim in the treatment of patients who are recuperating from gastro-intestinal surgery; but the patient should be warned that the return may be slow and that it is imperative that he follow the regimen carefully.

Most surgeons have their own preferred schedules which they wish to have followed, but most of them incorporate the principles stated above. By way of illustration, however, a typical regimen is given.

Diet in Surgery of the Stomach or the Duodenum. This operation may consist of resection of a large part of the stomach and a section of the duodenum, either for cancer or for peptic ulcer. The usual procedure is to give nothing by mouth for from 24 to 48 hours after the operation and to provide for the body's nutritional needs by intravenous fluids. After this, water in small amounts is given by mouth from 2 to 4 ounces an hour, as tolerated. The patient may then go on such a regimen as outlined on pages 402 and 403, incorporating the principles of bland, small frequent feedings and omitting stimulating or mechanically irritating foods.

Surgery of the Gallbladder. Since the area surrounding the removed gallbladder is irritated and inflamed, it is customary to continue the low-fat diet for from 3 to 6 months following operation. Cholecystokinin, the hormone produced in the duodenum by the presence of fat, not only stimulates the contraction of the gallbladder but also of the smooth muscle in the common duct and the ampulla of Vater, the opening of the common duct into the intestinal tract. Even with the gallbladder removed, there is possibility of pain from contraction of these other areas upon the ingestion of considerable amounts of fat. This is the indication, therefore, for a low-fat diet. The restrictions for this diet will be found in Chapter 25.

Diet in Ileostomy or Colostomy. This diet is described in detail in Chapter 24.

Dietary Regimen Subsequent to Operations on the Stomach or the Duodenum[2]

Day After Operation	Time	Food	Amount
4	A.M.		
	8	Bland cereal* gruel	100 cc.
	10	Milk	100 cc.
	12 noon	Cream soup, strained	100 cc.
	P.M.		
	3	Gelatin, plain, with cream	100 cc.
	6	Bland cereal with cream	100 cc.
	8	Jello, plain, with cream	100 cc.
5	A.M.		
	8	Bland cereal with cream	150 cc.
	10	Gelatin, plain, with cream	150 cc.
	12 noon	Cream soup, strained	150 cc.
		Melba toast	½ piece
	P.M.		
	3	Baked custard	2 tbsp.
	6	Rice with cream	2 tbsp.
	8	Milk and cream	150 cc.
6	A.M.		
	8	Bland cereal with cream; sugar	150 cc.
		Egg, poached or soft cooked	1 egg
		Milk or Postum	100 cc.
	10	Gelatin with cream	100 cc.
	12 noon	Cream soup, strained	100 cc.
		Melba toast	½ piece
		Butter	½ square
		Milk or Postum	100 cc.
	P.M.		
	3	Baked custard	2 tbsp.
	6	Rice with cream	2 tbsp.
		Melba toast	½ piece
		Butter	½ square
		Milk or Postum	100 cc.
	8	Eggnog	150 cc.

* Bland cereals include cream of wheat, cornmeal, farina, strained oatmeal.

[2] Sister Mary Victor: Surg. Clin. North America 20:1211, 1940.

FURTHER ADDITIONS

Day After Operation	Time	Food	Amount
7	8 A.M. 12 noon 6 P.M.	Melba toast Pudding, bland Fruit purée, bland	½ piece 2 tbsp. 1 tbsp.
8	8 A.M. 12 noon 6 P.M.	Melba toast or rusk Potato, baked or mashed Potato, baked or mashed	½ piece 1 serving 1 serving
9	12 noon and 6 P.M.	Vegetable purée	1 tbsp.
11	12 noon and 6 P.M.	Cottage cheese or egg dish	2 tbsp.
14	12 noon	Chicken or fish	1 serving
15	8 A.M.	Orange juice Brewer's yeast	100 cc. 6 tablets
42		Tenderloin steak, lamb chops, tender roast beef, tender roast lamb, crisp bacon, unstrained vegetables*	

*The permissible unstrained vegetables include cooked carrots, beets, asparagus tips, squash, string beans and young tender peas.

Following operation for hemorrhoids or other rectal surgery, an opiate usually is given to prevent defecation. A residue-free diet is also given for 2 or 3 days to avoid a bowel movement. A low-residue diet is given for the next 3 or 4 days. (See Chap. 24 for diets varying in residue.) Often an oil enema is prescribed. Other bland, laxative foods may be added until the patient is back on a regular diet.

Tonsillectomy Diet

After a tonsillectomy or other minor mouth or throat operation, cold fluids only are allowed for the first 24 hours. Water, milk, vanilla ice cream and bland fruit juices such as pear or white cherry juice are permitted. The adult patient may find iced tea or coffee refreshing. The second day warm, but not hot, liquids are added. Soft bland foods such as milk toast, custard, soft-cooked egg, soft-cooked cereals and vegetable purées may be permitted on the third and the fourth days. The patient usually discovers what foods will slip down easily; it may be from

several days to a week before a regular diet can be resumed.

Radical Surgery of the Mouth and the Throat

Following radical surgery of the mouth or the throat, the patient may have to be on a liquid diet for a long period of time. Although at first this may have to be administered by tube, it is essential that the diet appear to be as nearly normal as possible. "Variety in the liquid diet can best be obtained by means of a food blender or liquidizer. With such an appliance meat as well as other foods can be liquefied, so that a diet approaching the usual pattern can be served. Instead of a succession of soups, eggnogs and other liquids, dinner may consist of meat, potatoes, vegetables, fruit and pudding, all liquefied. Soft and liquid diets may also be prepared by putting the food through a food mill or sieve and adding liquids. If these devices are not available, commercially prepared baby foods can be used since they contain only a small amount of seasoning."[3]

The tray should be served in the usual fashion, so that the patient will have the pleasure of sight and odor of food to stimulate his appetite.

Tube Feedings

There are other occasions when, because of operation, accident or unconsciousness, the patient must be fed by tube. If this type of feeding is to be continued for some time, it is important that the diet be adequate for all nutritional needs and yet liquid in consistency.

If the patient is conscious, and as soon as his condition will allow, a variety of liquid food prepared by blender, as described under Radical Surgery of the Mouth and the Throat, is to be preferred in place of a prepared tube feeding.

In the unconscious patient, it is particularly important for the nurse to realize that good nutrition is essential in the prevention of pressure sores and decubitus ulcers. Immobilization causes an increased breakdown of protein tissue, which must be replaced by a more than adequate amount of protein in the diet. (See Chap. 19.) Unconscious patients sometimes resist being fed, but that should not deter the nurse from seeing that an adequate intake of food is achieved each day.

Tube Feeding 1, at the top of page 405, supplies 74 Gm. protein, 77 Gm. fat and 209 Gm. carbohydrate, which furnishes a total of 1,825 calories. It is adequate in protein, calcium and the principal vitamins except niacin. It is also low in iron. These should be supplied by medication.

Tube Feeding 2, also on page 405, is somewhat lower in protein but higher in calories. It supplies all the essential nutritional factors but is slightly below the optimum standards for niacin. The protein can be increased by the addition of dried skim milk powder.

A variety of beverages suitable for tube feedings will be found in Chapter 50. If one of these is to be used for a period longer than a few days, it should be calculated for nutritive content, including calories, protein,

[3] Cancer Nursing, A Manual for Public Health Nurses, New York State Department of Health, 1950.

Tube Feeding 1

Food	Measure	Weight	Pro.	Fat	Cho.	Calories	Ca	Fe	Vitamins: A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
		Gm.	Gm.	Gm.	Gm.		Gm.	mg.	I.U.	mg.	mg.	mg.	mg.
Milk	1½ qts.	1,500	53	60	74	1,048	1.77	1.1	2,400	.60	2.5	1.5	15
Glucose or sugar	½ c.	120	......	......	120	480	......	......	......	......	......	......	......
Enriched Farina or str. cereal	Cooked ⅔ c.	120 (20 raw)	2	......	15	68	.03	.3	......	.74	.1	.2	......
Eggs	3	150	19	17	......	229	.08	4.1	1,710	.18	.5	.2	......
Vi Penta	15 drops	......	......	......	......	......	......	......	15,000	1.50	1.5	3.0	75
Na Cl	2 Gm.	......	......	......	......	......	......	......	......	......	......	......	......
Total		1,890	74	77	209	1,825	1.88	5.5	19,110	3.02	4.6	4.9	90

Directions: Beat the eggs slightly. Add all other ingredients and mix thoroughly. Strain the mixture through a fine sieve, pour in bottles with covers, label, and place in the refrigerator. Tube feeding should be warmed in a double boiler to body temperature before giving.

Note I. In the presence of anemia iron therapy should be considered.

Note II. If a tube feeding is needed for a patient suffering from malnutrition and showing a low serum protein, protein hydrolysates may be added.

(Manual of Diets, Presbyterian Hospital, New York City.)

Tube Feeding 2

Food	Measure	Weight	Pro.	Fat	Cho.	Calories	Ca	Fe	Vitamins: A	Thiamine	Riboflavin	Niacin	Ascorbic Acid
		Gm.	Gm.	Gm.	Gm.		Gm.	mg.	I.U.	mg.	mg.	mg.	mg.
Eggs	5	250	32	30	2	405	.134	6.7	2,830	.25	.72	.2	......
Milk	1 pint	500	18	20	25	340	.590	.5	800	.20	.85	.5	5
Cream, 20%	⅘ pint	400	12	80	16	816	.388	.4	3,320	.12	.56	.4	4
Glucose solution, 50%	⅘ pint	400	......	......	200	800	......	......	......	......	......	......	......
Orange juice	⅘ pint	400	4	......	44	176	.072	.8	720	.32	.12	.8	196
Salt	1 tsp.	5	......	......	......	......	......	......	......	......	......	......	......
Vegex*	2 tsp.	12	......	......	......	......	......	8.4	......	1.08	0.56	8.4	......
Total		1,967	66	130	287	2,537	1.184	16.8	7,670	1.97	2.81	10.3	205

Directions: Dissolve Vegex in hot glucose solution. Cool. Beat eggs, add milk, cream, salt and cooled glucose solution. Beat until well mixed. Add orange juice. Stir and refrigerate. Quantity 2 quarts, contains 2,500 calories. To serve, warm over warm (not hot) water. Serve in warmed container. (The New York Hospital Diet Manual, New York City.)

*A commercial preparation of autolysed yeast to which iron has been added.

minerals and vitamins. (See Table 1, Part Four.) Deficiencies should be made up by concentrates. (See Recommended Allowances, p. 126.) The less expensive dried skim milk may be substituted in any of these feedings for Casec or Lonalac if the salt content is not a factor. Undiluted evaporated milk may be substituted for cream or used diluted instead of whole fluid milk.

All tube feedings should be given slowly or diarrhea may result. If diarrhea is constant, the addition of 2 tablespoonfuls of strained apple sauce or ½ ounce of fluid pectin (such as Certo) to one quart of feeding may be beneficial. Tube feedings may also be given by a drip method to prevent diarrhea.

BURNS

Severe burns are a surgical problem and usually require skin grafting in order to provide a covering for the injured area. There is massive loss of intracellular fluids, salts and serum proteins through exudation. There also seems to be an excessive loss of nitrogen through the urine. If these losses are not corrected, shock, toxemia, anemia and hypoproteinemia result. Plasma and whole blood are given immediately, and protein hydrolysates are also given as soon as feasible. When food can be taken by mouth, a high-caloric, high-carbohydrate, high-protein, high-vitamin diet should be used. Harkins[4] *et al.* state that, depending on the degree of burn, the calories should be from 3,000 to 5,000 per day, the protein from 125 to 300 Gm. per day, and adequate vitamins and iron should be given as medication. Individual consideration is extremely necessary to carry out the proper feeding of the patient with severe burns.

[4] Harkins, H. N., Cope, O., Evans, E. I., Phillips, R. A., and Richards, D. W.: J.A.M.A. **128**:475, 1945.

STUDY QUESTIONS

1. Cite examples of patients you have seen who illustrate the symptoms requiring attention before operation can be performed.
2. Why is the treatment of hypoproteinemia of importance both before and after operation?
3. Why is food withheld from the patient just prior to operation?
4. How can a patient be given nutrients before he is able to take food by mouth?
5. What special procedures must be followed after a gastric resection; after a rectal operation; after a tonsillectomy?
6. Plan a tonsillectomy diet for an adult for the first postoperative day.
7. Plan a menu for a patient with a radical mouth operation who is on a fluid diet, making it as nearly normal as possible.
8. How can the protein in a tube feeding be increased? What can be done if a patient on a tube feeding develops diarrhea?
9. What means can you take to get a severely burned patient who can take food by mouth to obtain a diet of 4,000 calories and 250 Gm. of protein?

CHAPTER THIRTY-THREE

Food Requirements in Diseases of Infancy and Childhood

INTRODUCTION
TYPES OF CHILDREN'S DISEASES
DISEASES SPECIFIC TO CHILDREN
DISEASES COMMON TO CHILDREN AND ADULTS

INTRODUCTION

When children become ill they tend to regress to an earlier developmental level. This is particularly true of their eating habits. A baby who has been drinking from a cup will refuse fluids given this way, but may accept them eagerly from a bottle. Self-feeding gives way to wanting to be fed. Also, the type of food the sick child will accept often is limited. The wisest response is to let him have his way. When he feels better, he will return quickly to his more recently acquired food practices and will make up, both in quantity and in quality, the nutrients that were missing in his diet during the time he was ill.

If an infant or a child must be hospitalized, one of the immediate problems may pertain to food. The child is in strange surroundings, among strange people; moreover, he is ill. All the concepts of child feeding discussed in Chapters 13 and 14 are applicable, but, besides this, the child must be given a great deal of freedom about his food, even to the point of allowing him to refuse it. Some children will eat only bread and butter and drink milk for the first few days in the hospital, as these foods are most reminiscent of home. This may be particularly true of children from homes with different national or regional food patterns from those in usage in the hospital. Other children will regress to feeding practices of an earlier age. Demands to be fed or for other types of attention should be met by the nurse with warmth and understanding. If the child is not too ill, he will soon follow the lead of other children in his group and become more self-sufficient.

Some hospitals have daily visiting hours for parents in the late afternoon and the early evening, so that they may feed and play with their children. Other ways of helping the child to feel at home in the hospital is to have him eat with other children of his age at a table as soon as this is feasible. Most of all, it is important that mealtime be a happy time, with no pressures about clean-

ing up plates, drinking all the milk or withholding dessert because the child has not complied with some rule about his eating habits. Especially, during an illness is not the time for a child to have to learn to eat new foods or to acquire new skills in eating unless he does this on his own initiative.

TYPES OF CHILDREN'S DISEASES

Children are subject to many diseases that are common to adults, as well as to some serious diseases which are associated primarily with childhood. Infants may develop feeding difficulties such as vomiting, colic, diarrhea and constipation. Both infants and children suffer from a variety of infections. Malnutrition, accompanied by underweight or obesity, occurs much too frequently when we consider the knowledge and the resources available to us.

Feeding Difficulties in Infants

Vomiting and Regurgitation

Vomiting may result from a number of causes and may or may not be a serious symptom. It closely resembles regurgitation when only small amounts of food are lost, while in vomiting the contractions of the stomach are sufficiently strong to empty the stomach. Persistent vomiting may be a symptom of infection, obstruction or other serious ailments. The occasional vomiting, however, is usually caused by overdistention of the stomach due to the ingestion of too large or too frequent feedings or to the swallowing of air. It may also be due to an imbalance of the food constituents, especially to an oversupply of fat, causing delayed emptying of the stomach. The cause should be determined and the feedings adjusted accordingly.

Regurgitation may be avoided by belching. This is brought about by patting the child on the back and laying him on the abdomen or right side for a nap immediately after feeding.

Colic and Flatulence

Colic or abdominal pain of a paroxysmal nature may be caused by overdistention due to the swallowing of air, to gas formed by bacterial fermentation of undigested food, to irritation due to the use of cathartics or to cold. An undernourished child may have sufficiently severe hunger pains to cause colic. Flatulence usually follows an attack of colic. However, it may be caused by bacterial fermentation, in which event the sugars of the food may be reduced or changed to a less fermentable type. It may be advisable to use protein milk or acidified milk. This is desirable also when there is inability to digest fat.

Since both colic and flatulence may result from swallowed air, it is important that the infant be "bubbled" to allow for the eructation of the swallowed air.

Diarrhea and Dysentery

Diarrhea is a common ailment of infancy and childhood, although it is less so than formerly, due no doubt to the more scientific handling of the milk supply. It occurs about four times as frequently in artificially fed babies as in breast-fed babies. Contamination of the milk may occur in the home even more frequently than

in the dairy and the distributing plant. (See Chap. 16.)

Chief Cause. While contamination or spoilage of food is mainly responsible for diarrhea, other factors may be involved; for instance, a too concentrated formula, especially of the sugars and the fats, underfeeding and irregularities in feeding. Irritants, such as cathartics, are a frequent cause. Diarrhea may also be caused by an allergic reaction to food, cow's milk usually being the offender.

Because the passage of food along the alimentary tract is abnormally rapid in diarrhea, much of the food is either undigested or at least unabsorbed; therefore, the child loses weight rapidly and soon shows symptoms of malnutrition which must be combated in the treatment. There is loss of water (dehydration), as well as loss of nutrients, and the gastrointestinal tract is also in an inflamed condition. The first part of the treatment, therefore, consists of rest. No food should be given until the diarrhea subsides. Water should be given, however, either by mouth or parenterally. Water usually may be given, a teaspoonful at half-hour intervals, the amount being increased gradually and the interval lengthened. When feedings are instituted, the food should be very dilute, the concentration increasing as the condition improves.

Some form of acidified milk is best suited for this condition, first the skimmed and later that made from the whole milk. Still later, sugar may be restored gradually to the formula.

Therapeutic Agent. The use of apple, either in commercially prepared powder or as the scraped fresh fruit fully ripened, has sometimes proved to be beneficial in the treatment of older children as well as of infants, owing probably to its pectin and its acid content. The scraped apple may be given every hour or two in quantities of 1 to 5 tablespoonfuls for 1 or 2 days. The apple powder should be mixed with water, 1 tablespoonful to 1 ounce of water. An infant should receive approximately 3 tablespoonfuls of the powder every 2 hours, day and night, varied according to the age and the specific requirement of the child. Banana powder may also be used in cases of diarrhea, and sometimes cooked refined cereal is helpful.

Dysentery is really a form of diarrhea but is produced by a specific organism of the dysentery group. Its symptoms are more severe than diarrhea, including the presence of blood, pus and mucus in the stools; unless properly diagnosed and treated, it may become recurrent or chronic.

Since the diarrhea of dysentery is caused by an infection of the intestinal tract itself and may continue for an indefinite time before immunity is established, the principal concern of the nurse is to maintain the nutrition of the child. Food must be given regardless of the diarrhea, although it may be necessary to give smaller quantities if normal food intake results in increased symptoms. The food should be low in fat and residue, high in protein, with some limited amounts of carbohydrate. Acidified skimmed milk should form the basis of the diet for infants, but for older children cooked, refined cereal may also be given.

Water must be given frequently

and in increased amounts in order to replace the losses effected by the diarrhea.

For children of school age the same principles as in the treatment of adults apply (see Chap. 24).

Constipation

Constipation in infancy is not infrequent, especially in artificially fed babies. Mother's milk, because of a higher carbohydrate content than cow's milk, is more laxative than the latter. Many mothers are concerned when the baby has only one bowel movement per day or alternate days. The number of movements per day is not of so much importance as the consistency of the stools. If the feces are expelled with difficulty, then the child may be said to be constipated and should be treated accordingly.

The formula may be made more laxative by the addition of (1) carbohydrate in the form of sugars, particularly lactose or a malt sugar; (2) fruit juices, especially prune or orange (or apple sauce for the older child); (3) whole-grain preparations, such as unstrained oatmeal or whole-wheat cereals; (4) puréed vegetables, supplying the finer form of fiber or bulk; (5) the vitamin B complex in the form of wheat germ, yeast or certain commercial preparations.

If constipation occurs in breast-fed infants, a supplementary feeding consisting either of malt extract in water or of diluted prune juice may be given prior to a nursing period. In older children a variety of dried fruits, especially prunes and figs and other fiber-containing foods, may be given once or twice daily. (See Constipation, Chap. 24.)

Infections

Infections characterized by fever usually impair the appetite. It is not necessary to restrict food intake during the acute stages, but the infant or child should be fed according to his appetite. He should be encouraged to take fluids freely and to return to regular food intake as soon as possible. If the child has a sore throat, do not give fluids that will aggravate it, such as acid fruit juices or salty broth. As the fever subsides the appetite usually becomes progressively better, and the food intake increases accordingly. If the illness has been prolonged with loss of weight, liberal feedings are indicated. (See Fevers and Infections, Chap. 19.)

In urinary and renal infections, such as cystitis, pyelitis and pyelonephritis, the treatment is the same as outlined in Chapter 28. The diet in tuberculosis, in rheumatic fever and in poliomyelitis is discussed in detail in Chapter 19.

Malnutrition, Underweight, Obesity

Malnutrition

Although, fortunately, obvious deficiency diseases are becoming rare, there are many children who do not grow and develop as they should because of poor food intake. In the breast-fed infant, the fault may lie with the mother's inability to supply sufficient milk for his needs, in which case the doctor will supplement the breast feeding with a formula. A formula-fed baby may not be getting enough of one or the other of the food constituents. Anemia may result from too long delay in adding a

variety of foods to the infant diet. In the older child, inadequate quantity of food, food not suited to his needs, or a diet lacking some of the nutritive essentials may be responsible for malnutrition. Enough rest and play may be as important in ensuring good nutrition of the child as the food itself. (See Chap. 13 and 14 for the food needs of infants and children.)

Underweight

Children vary greatly in their rate of growth. If a child gains weight and grows in height at a regular rate, even though he is somewhat thinner than other children of his height and age, there is no cause for alarm. The child who fails to grow and gain regularly should have not only his food habits but also his patterns of sleep, rest and exercise investigated and corrected where necessary. Between-meal feedings, especially at bedtime, added to a normal, adequate food intake, as well as sufficient sleep, are indicated as necessary for the underweight child.

Obesity

Overweight is due to an excess of food over and above the bodily requirement. This may be due in some cases to a lowered basal metabolism, but it is usually due to overeating and lack of exercise. Therefore, the diet should be calculated carefully and reduced in caloric value so that the weight loss is steady—usually not more than 1 pound per week. In cases of moderate obesity in young teenagers—that is, 10 to 15 pounds above the average—it is only necessary to maintain the child's weight at this level until he has grown to the height which would be normal for this weight.

Care must be taken to see that all the essential foods are given, including 1 quart of milk per day, 1 egg, at least 1 serving of lean meat, 2 cooked vegetables, 1 or 2 fresh vegetables and 2 to 3 fresh fruits, also 3 teaspoonfuls of butter or fortified margarine and 2 servings whole-grain or enriched bread.

For the younger child it is advisable to give fish-liver oil to supply the vitamins A and D.

The work of Hilde Bruch[1] has indicated that much overeating may be of psychological origin. It is advisable, therefore, that the dietitian or nurse who is following a child on a low-caloric diet have great sympathy and understanding of the problems involved. Encouragement will help more than scolding, even when the diet has not been followed, and a personal interest in the child is of paramount importance.

The principles involved in the treatment are explained further in the chapter on underweight and overweight (see Chap. 18).

DISEASES SPECIFIC TO CHILDREN

Nephrosis

Nephrosis occurs most commonly in children from 2 to 5 or 6 years old. It differs from nephritis in that, although it is characterized by massive albuminuria and edema, there is no loss of red and white blood cells in the urine and no urea nitro-

[1] Bruch, Hilde: J. Am. Dietet. A. **20**: 361, 1944.

gen retention in the blood, at least in the early stages. The most distressing symptom is the edema. Fortunately, the use of the pituitary hormone ACTH or cortisone often effects a diuresis and subsequent lessening of the edema. It is not known at present whether these hormones also affect the recovery of kidney function.

Dietary Treatment

The diet should be high in protein to counteract the loss of serum albumin and low in sodium to lessen edema. These children usually are very ill and, as a result, have a poor appetite. Every effort should be made to get the child to eat. Foods seasoned to minimize the lack of salt (see Chap. 27), low-sodium beverages (see Chap. 50) and ice cream made with Lonalac (low-sodium milk), flavored with fruit sauce, may help to tempt the child to eat.

Celiac Disease

This is a type of chronic intestinal indigestion occurring chiefly in young children.

The onset is gradual, beginning usually after the first year of life, but it may occur as late as the fifth year. Little is known of its etiology, but there is a low tolerance for all fats and most carbohydrates, especially the disaccharides and the polysaccharides. It is known that the pancreatic enzymes are present in normal amounts in the duodenum; hence, the conclusion is drawn that the cause of this disease is lack of absorption rather than failure of digestion.

The symptoms are:

1. A prominent, protruding abdomen.

2. Voluminous, pale stools, semifluid, frequent, foul smelling and of high fat content. The daily output on successive days is surprisingly large.

3. Loss of weight or stationary underweight persisting for months or even years without discernible cause.

4. Marked edema of the face and the extremities, tongue sore and red.

5. Marked retardation of growth.

6. Loss of appetite, vomiting, secondary anemia and excessive irritability are also frequently encountered.

Dietary Treatment

The course of celiac disease is long and stubborn and, as one writer remarks, "The cure of this unique disease is as mysterious as its origin."

Clinicians agree that the only effective treatment is proper diet. Protein forms the basis of the diet, since it is the only food constituent which is digested and absorbed without difficulty. The carbohydrate of bananas is an exception to the findings already stated, since it is generally well utilized when derived from ripe fruit, whether baked or raw or given as banana powder.

Modified milk must be used in the diet. Protein milk may be prepared in the home or made from commercial powders. Jeans and Rand[2] state that because of its fat

[2] Jeans, P. C., and Rand, W.: Essentials of Pediatrics, Philadelphia, Lippincott, 1946.

content, even though low, it is not always tolerated, in which case boiled skimmed milk is recommended. They outline the following as suitable for the initial diet of a 2- or 3-year-old child:

30 ounces of boiled skimmed milk, 2 to 3 egg whites, 1 ounce of cottage cheese, 1 ounce of sieved liver, 6 to 7 ounces of dextrose, 8 ounces of strained orange juice, 8 ounces of sieved tomatoes, beef juice and 1 to 2 teaspoonfuls of cod-liver oil or the equivalent in other fish-liver oils that may be more potent. The dextrose may be given in 10 to 20 per cent solution, flavored with orange juice.

They find that dextrose is well utilized when given at intervals between meals.

Bananas are well tolerated and may be eaten in large enough quantities to provide the bulk of the needed calories in the diet. They also provide, in the quantities often consumed in this disease, a considerable amount of minerals and vitamins. Great care must be taken that no starch enters the diet for a period of several months, usually for more than a year. Fat is returned to the diet earlier than starch. After continued improvement is noted, other sources of protein may be added, such as finely chopped lean meat or chicken or gelatin prepared without sugar. However, it may be sweetened with saccharine. Strained vegetables and puréed fruits are added later. It must be remembered that all additions to the diet should be made gradually, beginning with very small amounts.

By the end of 6 months or a year, a typical diet would be as shown below.

No further additions should be made for a long time. Particularly to be avoided are butter, cream, ice cream, fats, fried foods, pork, bacon, potatoes, candy and cake. Only gradually should the child return to a general diet.

A more liberal diet for this disease is advocated by Haas and Haas, who believe that fat is tolerated quite early in the disease, and that only starches must be omitted over a period of a year or more. Proteins from any source are allowed and fats in moderation after a trial period on the so-called basic diet as follows:

"*Breakfast:* Pot cheese, bananas, protein milk

Boiled whole milk (or whole lactic-acid milk, or equal parts of evaporated milk and water)	1 qt.
Cottage cheese	1 oz.
Whole eggs (boiled or coddled)	2
Boiled liver, alternating with ground beef, fish or chicken	2 oz.
Corn sirup	4 oz.
Puréed fruits (dried peaches, sieved stewed pears or apricots)	3 oz.
Strained tomatoes, peas, squash, string beans or carrots	6 oz.
Cornflakes	1 oz.
Well-cooked rice (1 hr.)	1 oz.
Dextrinized toast	1 slice

"*Lunch:* Meat, pot cheese, bananas, protein milk

"*Supper:* The same as lunch; gelatin may be added to any meal

"Any of these foods may be used in any quantity or given between meals.

"After one week, orange juice, other cheeses and egg may be added, one at a time and with sufficient interval to test the acceptability of each. After two weeks, all fresh fruits may be tried in the same way. When stools are controlled, vegetables (except potato and corn) may be added; sometimes they are well tolerated but often their introduction must be postponed. Tolerance is eventually attained, at which time the diet is complete. . . .

"Duration of the treatment is of utmost importance. The strict celiac diet must be continued for at least one year. If there has been no recurrence of symptoms, forbidden carbohydrates may be added; one slice of bread three times daily, or a bowl of cereal once and bread twice; or cereal at breakfast, toast at lunch, and spaghetti for supper. If these additions to the diet cause no diarrhea, then potato is given. After 3 months with no disturbance, plain milk is added, and if no diarrhea occurs in the next 3 months with these additional foods, the patient may be considered cured, and all restrictions on the diet may be lifted. As a rule, the entire cure requires no more than 18 months, but when the diet has not been followed rigorously, it may take a much longer time."[3]

[3] Haas, S. V., and Haas, M. P.: Management of Celiac Disease, Philadelphia, Lippincott, 1951.

Starch Intolerance

The exact cause of starch intolerance is not definitely known; it occurs more frequently than classical celiac disease. The stools are frothy, foul smelling, high in starch but normal in fat content. There is decreased amylase in the pancreatic juice. The prescribed diet, therefore, is low in starch, the carbohydrate coming from sugar, honey, fruits and strained vegetables; the protein is normal, all types are allowed; and the fat is normal. Starch, such as cereals and bread, cannot be added for long periods of time, if at all.

Pancreatic Insufficiency

Cystic fibrosis of the pancreas is a congenital disease resulting in pancreatic-enzyme insufficiency. It is characterized by widespread change of the mucus-secreting glands of the entire pancreas. The stools contain both fat and protein. The pancreatic enzymes are markedly decreased or entirely absent. The diet is high caloric (30 to 50 per cent above normal requirement), average carbohydrate, with the simple sugar supplying the greatest part since starches are not well tolerated. The protein is high and fat moderate. There should be a high vitamin A intake. Pancreatin is given with each feeding to help in the fat digestion.

Cerebral Palsy

Children with cerebral palsy present very special nutrition problems. Their lack of neuromuscular control makes it difficult for them to drink from a cup or otherwise feed themselves. They tend to be underweight and seem to be very susceptible to dental caries. In an excellent review

of the emotional, physical and nutritional feeding problems of the child with cerebral palsy, Abel[4] says: "The need for calories is increased in all forms of cerebral palsy. Spasm and muscle tension as well as overactivity increase energy expenditure." She suggests a full, adequate diet made as concentrated as possible. To make the food easier to manage, eggs, if they are hard-cooked, and fruits and vegetables may be eaten by hand. Citrus fruit juices increase drooling, and ascorbic acid may have to be substituted. Feeding time should be quiet and relaxed with all possibilities of excitement eliminated.

DISEASES COMMON TO CHILDREN AND ADULTS

Cardiac Disease

Congenital heart disease and cardiac damage due to rheumatic fever are discussed in Chapter 27.

Diabetes

The two schools of thought in regard to the dietary treatment of diabetes are discussed in Chapter 21. It is particularly difficult to keep children, and especially adolescents, on carefully controlled diets. Many physicians feel that the emotional trauma of keeping children on such diets is more harmful than the spilling of sugar into the urine. An ordinary diet containing all the essential nutrients for normal growth and development is permitted, and insulin is prescribed as needed. As long as the child grows and gains weight normally and has no ketonuria, the sugar in the urine is disregarded. For further details see Chapter 21.

[4] Abel, M.: Am. J. Nursing **50**:558, 1950.

Allergy

Acute food allergies, such as allergy to cow's milk, to orange juice and to egg, are not uncommon in children. They may appear very early in life. In very young infants, the feedings may consist of protein hydrolysates as the only food the child can tolerate until the symptoms clear. An "elimination diet" suitable for older children consists of lamb, rice, carrots and soybean "milk." Vitamins must be added as supplements. The problems of allergy are discussed in Chapter 26.

Epilepsy

Epilepsy rarely occurs during infancy, but it may appear from very early childhood on. The dietary treatment is discussed in Chapter 30.

Nephritis

The dietary treatment of this disease is discussed in Chapter 28.

STUDY QUESTIONS

1. What may the mother or the nurse expect of a child's food habits when he is ill?
2. How can a child be helped to adjust to eating his food in the hospital?
3. What modifications of the diet may be necessary to treat vomiting, colic and flatulence?
4. What are the causes of diarrhea and dysentery? What dietary measures are indicated for each?
5. What additions can be made to the feedings of an infant having constipation?

6. How are acute fevers in childhood treated by diet?

7. What are some of the causes of malnutrition in children?

8. List some of the causes of underweight.

9. What advice would you give a mother whose child is overweight? What should be your relationship to the child?

10. Why is a high-protein, low-sodium diet indicated in nephrosis? Make a menu for a day for such a diet for a 3-year-old child, containing 75 Gm. protein and less than 200 mg. sodium. (See Tables 1 and 7, Part Four.)

11. What type of diet is indicated for the treatment of the conditions included in the celiac syndrome? Explain the reason for each type of diet.

12. Plan a day's diet for a child with celiac disease.

13. How may some of the special dietary needs of the child with cerebral palsy be met?

14. What are the dietary problems of the child with rheumatic fever? With diabetes?

15. Name an "elimination diet" suitable for a small child suspected of having a food allergy. Is it adequate to meet his nutritional needs?

Part Three

FOOD SELECTION AND PREPARATION

Part Three deals with Food Selection and Preparation. Small quantity recipes are especially adapted for the use of the nurse in dealing with the food problem of the private patient.

CHAPTER THIRTY-FOUR

Introduction to Food Selection and Preparation

ADEQUATE MENU FOR A DAY
FOOD FOR THE PATIENT
USE OF RECIPES
MEASURING INGREDIENTS
COOKERY TERMS
CARE OF UTENSILS AND DISHES

Food selection in a broad sense covers more than the choice of an adequate amount of variety foods. It includes planning for the day good meals which will be not only adequate nutritionally but satisfying to the appetite and to the taste. Foods which contrast in food value, color, flavor and texture, and blend, or, as it is often expressed, "go together," should be chosen to make up a meal.

ADEQUATE MENU FOR A DAY

An adequate and attractive menu for a day can be planned very easily on the basic dietary pattern which was discussed in Chapter 10. This can be varied from day to day, as well as from week to week, and there need be little repetition of the various items which make up a meal unless, as may be the case when it comes to breakfast, there is a preference for one type of menu. The basic dietary pattern, which includes one pint of milk, one serving of meat, one egg, one serving of some other protein food, two servings of fruit (one of the citrus variety, or tomatoes), one serving of a green or a yellow vegetable, one serving of another vegetable, one small potato, three slices of whole-grain or enriched bread, one serving of another cereal of the same type, three pats of butter or margarine, will provide an adequate, or almost adequate, amount of every dietary essential excepting calories. This allows for the use of sugar and shortening, which add so much to the texture and the flavor of so many cooked dishes; for the use of butter, cream or oil as dressing for vegetables and salads; and for the inclusion of extra fruit and other foods which have appetite appeal. The total amount in excess of the basic pattern should depend upon the caloric requirement rather than on the appetite alone.

It is not necessary to make any dietary calculation in planning meals for the normal person. It is good practice, however, to consider weight as one of the indications of normality. If weight is greater than average, menus should follow as closely

FIG. 72. An attractively set tray tempts the appetite.

as possible the basic pattern without caloric additions. If weight is under, it may be well to increase the amount of milk and eggs and to choose or provide foods which will especially tempt the appetite. Food will often alleviate fatigue and a condition which is often known as nervousness, both of which may be either contributing causes or symptoms of underweight.

The three-meal-a-day plan is generally accepted. There should be no omission of breakfast, which should be adequate, although not necessarily heavy. The main meal of the day may be served at noon or in the evening, to suit convenience and preference. The basic pattern calls for meat, potatoes, some other vegetable and a dessert, with the addition of a salad if not used at another meal. The same general plan may be followed for the lighter meal, either luncheon at noon or supper in the evening, when a supplementary protein other than meat may be the main dish. This may be in the form of a soup made with a milk base, or an egg or a cheese dish. Such dishes will sometimes be used as the main source of protein. Recipes will be

found in Chapter 40 (Eggs), Chapter 42 (Cheese) and Chapter 38 (Cereals). Recipes for use of dried vegetables (legumes), which are also high in protein, will be found in Chapter 49 (Family-size Inexpensive Recipes). A dessert, which adds satisfaction to both luncheon and dinner, gives another opportunity for the use of milk and eggs.

The preparation of each meal depends first of all upon having all ingredients on hand. The order of preparation of each dish, so that all may be ready at the meal hour, should be considered first. If a baked product is in the meal plan, the oven should be preheated at the proper temperature and time should be allowed for this as well as for baking. The time indicated for the proper cooking of meat, fish, eggs and vegetables should be estimated in order that they may be served as soon as they are cooked. Salad ingredients should be taken out of the refrigerator, where they have been placed in order to be crisp, and put together just before serving time. The table or tray should be set so as to be ready when the food is at its best. Dishes for hot food should be warm, while those for cold food should be cold or even chilled in the refrigerator.

FOOD FOR THE PATIENT

One of the responsibilities of the nurse is to make sure that the patient for whom she is caring is provided with appropriate, well-cooked and attractively served food. This is particularly important when the condition of the patient demands the restriction of certain foods. The food preferences of the patient must be considered, and if foods to which there is a prejudice must be included, they should be made as attractive as possible in seasoning or flavor and in appearance.

When food preferences are based upon national or regional food habits, the problem is even more difficult. For instance, in the case of a patient on a general diet who refuses milk as a beverage, effort should be made to use an extra amount in cooked dishes. These will not always be acceptable, however, to patients whose tastes have been conditioned by certain cultural customs.

While the nurse will seldom have the responsibility of planning meals or have a hand in their preparation (except in the case of a private patient) she should be familiar not only with the nutritive contributions of food but also cookery methods. Through this knowledge she will be better able to help the patient to adjust to a prescribed diet.

Often, the nurse will be responsible for tray arrangement. Clean, crisp linen and suitable dishes, heated or chilled according to the food to be served, and well arranged, all play a part in making food more tempting.

Simple garnishes which contrast in color with the food often make a dish more tempting. Fresh sprigs of parsley, strips of pimiento or green pepper may often be used to good advantage with main dishes. A few berries, cherries, strips or segments of other fruits of bright color may add an interesting note to a plain dessert. A flower laid on the tray or placed in a low vase which cannot easily be upset may add a finishing

touch. It is worth while to take pains with the preparation and the service of food.

USE OF RECIPES

A recipe is a formula by which the proportions of the ingredients have been found by experiment to produce desirable results when combined according to the directions in the method. A recipe should be read carefully, and ingredients should be assembled before food preparation is begun. The recipes in the following chapters are for as small quantities as possible to ensure successful results.

The use of small utensils for the preparation of small recipes is an aid to success. A pint saucepan, a very small double boiler, a small strainer, a small drip coffee pot and a small teapot will make the preparation of small quantities easier and more successful than would be the case otherwise. It should be noted that the time allowance for small recipes is usually shorter than for the preparation of those of family size. Most small-quantity recipes prepared on top of the stove should be cooked over low heat. Temperature and time should be regulated carefully when individual baking dishes are used.

MEASURING INGREDIENTS

For the successful use of a recipe accurate measurements are important, particularly in the case of flour, sugar, shortening and leavening agents, such as baking powder and soda. Flour and confectioner's sugar must be sifted before measurement.

For the sake of texture and flavor, certain variations may be made according to taste after the basic preparation has been accomplished. At this time, for instance, more liquid may be added to a soup or sauce recipe and more seasoning may be added to taste to any dish. In fact, the cook should form the habit of tasting with a critical palate every dish which she prepares before serving.

For accurate measuring the following utensils are essential: An 8-ounce measuring cup divided into fourths and thirds or a set of measuring cups of the above volumes; tablespoons and teaspoons of regulation sizes or a set of measuring spoons.

To measure dry material by the cup, fill lightly with a spoon to brim or to indicated cup level. Do not shake the cup to level the materials. This is particularly important in the case of flour sifted before measurement. Granulated sugar may be measured easily, but brown sugar should be packed firmly into the cup. Before measuring honey or syrup, rinse the cup with cold water.

Measurements of butter and margarine, when they are in ¼-pound sticks, may be made by accurate division. One stick corresponds to the measurement of ½ cup. To measure bulk fat, pack firmly into cup to the desired mark of measurement. Except for pastry, fat should be at room temperature. (An easy method to measure half a cup of shortening is to fill cup to half mark with cold water and add shortening enough to cause water to rise to the one-cup mark. To measure a quarter of a cup, fill with cold water to the three-quarter mark.)

To measure dry ingredients by the tablespoon or teaspoon, fill until heaping and with the cutting edge of a knife brush off all that extends above the edge of the spoon. If one-half spoonful is desired, divide the contents of the spoon lengthwise and push off one-half. If one-fourth is wanted, divide the remaining half crosswise of the spoon and push off the portion not desired. If one-eighth is desired, divide the remaining one-fourth crosswise and push off the portion not needed. If one-third of a spoonful is desired, divide the contents of the spoon crosswise into thirds, pushing off the undesired portion.

To measure spoonfuls of liquid dip the spoon into the liquid.

TABLE OF MEASURES AND APPROXIMATE WEIGHTS

3 teaspoons	1 tbsp.
16 tablespoons	1 cup
½ cup	1 gill
2 cups	1 pt.
4 cups	1 qt.
2 pints	1 qt.
4 quarts	1 gal.
1 tablespoon butter	½ oz.
*1 tablespoon liquid	½ oz.
1 tablespoon flour	¼ oz.
1 tablespoon sugar	3/5 oz.
*1 cup liquid	8 ozs.
1 cup flour	4½ ozs.
1 cup butter	8 ozs.
1 cup sugar	10 ozs.

* Water or milk.

To measure butter or other solid

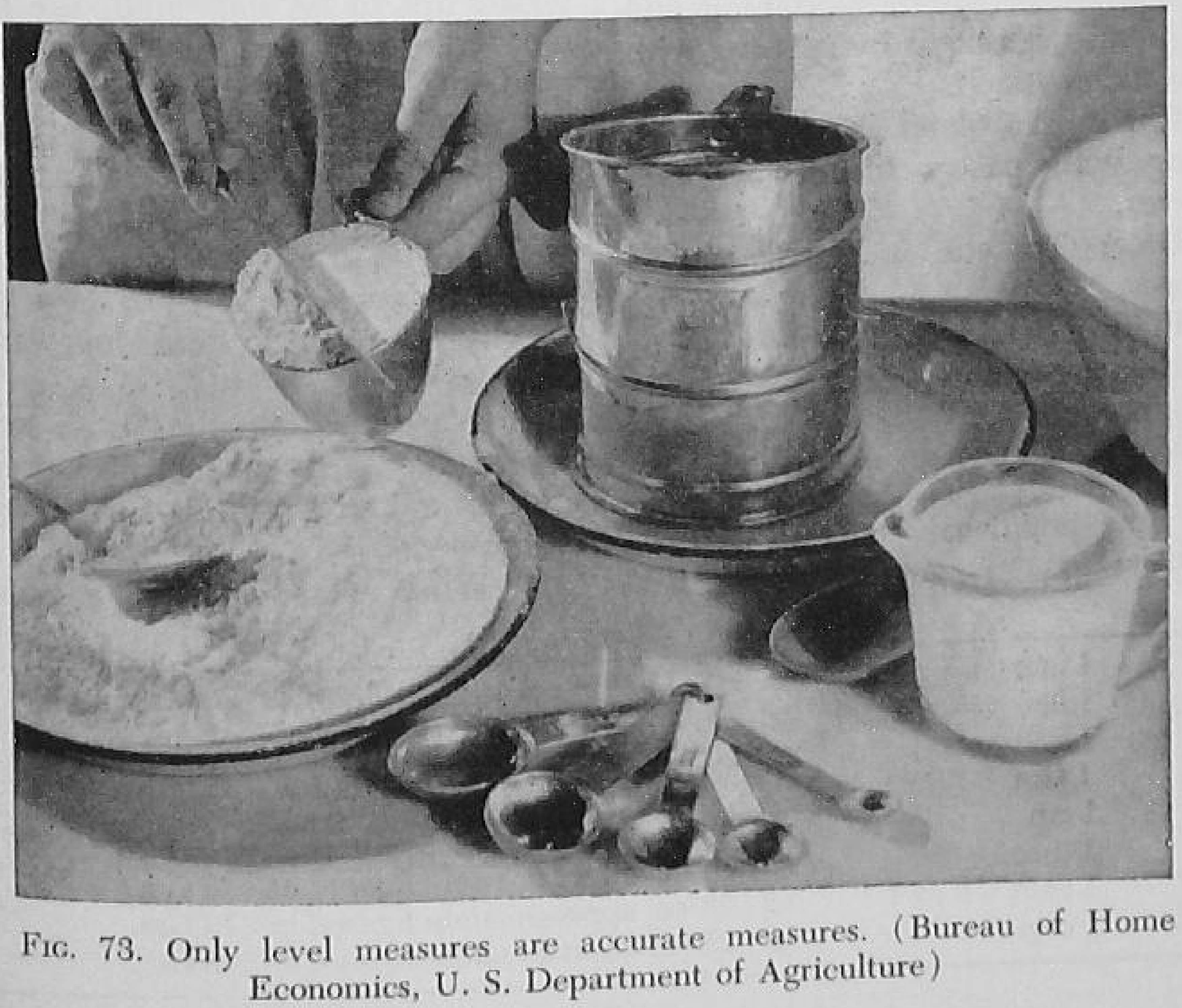


FIG. 73. Only level measures are accurate measures. (Bureau of Home Economics, U. S. Department of Agriculture)

fats, pack solidly into the spoon and level with a knife.

The Metric System and Its Equivalents[1]

The metric system of weights and measures is commonly used in all types of scientific work. Dietary prescriptions are usually written in this system. The unit of volume is the liter (approximately one quart) of water which weighs 1,000 Gm. or 1 kilogram.

Below is given a table of metric weights and measures and their equivalents. When preparing weighed diets extreme accuracy is necessary, but for rough estimates approximate figures may be used.

COOKERY TERMS

Cream: To soften shortening and to blend with sugar by rubbing with a wooden spoon.

Cut in: To blend shortening with flour with pastry blender or two knives.

Dice: To cut in small square pieces.

Fold: To add whipped cream or beaten egg whites with a careful cutting motion.

Mince: To cut or chop fine.

Purée: To press food through a sieve.

Sauté: To cook in a small amount of fat.

Sear: To brown quickly over direct heat or in oven.

Shred: To cut or tear in thin strips.

Simmer: To cook in liquid just below boiling point.

Steep: To let stand in hot liquid below boiling point.

CARE OF UTENSILS AND DISHES

Intelligent planning for the use of utensils and dishes and their care after use is a factor in efficient food preparation. This includes the following points:

1. When both dry and liquid materials are to be measured, use the measuring cup first for the dry ingredients, then for the liquids.
2. Rinse cooking utensils as soon as possible. Use hot water for those which have contained sugar, syrup or fat. Wipe greasy utensils with soft paper before rinsing. For eggs or starchy ingredients, use lukewarm water.
3. Wash cooking utensils as soon as possible. This makes meal preparation and dishwashing neater and easier.
4. When water is hard, a water

[1] For additional equivalents see Table 11, Part Four.

1 liter (by volume)	= 1,000 cubic centimeters (cc.) = 1.06 qts.
1 liter (by weight)	= 1 kilogram (Kg.) = 1,000 Gm. = 2.2 lbs.
1 oz.	= 28.34 Gm.
1 Gm.	= 1 cc.
1 tsp.	= 5 cc.
1 tbsp.	= 14 cc. approximately figured at 15 Gm.
2 tbsp. (1 oz.)	= 28 cc. approximately figured at 30 Gm.
1 cup	= 225 cc. approximately figured at 240 Gm.

softener is recommended before soap is used. A "soapless soap" which is a detergent may replace both water softener and soap.

5. Order of dishwashing: Rinse dishes and stack in an orderly pile to the left of sink. Wash in this order: glass, silver, small table dishes, then serving dishes. Place washed dishes in drainer and rinse with very hot water, or rinse in very hot water and place on towel. If dishes shine and do not streak, further drying by the towel is unnecessary. Place dried dishes on tray to return to cupboards.

CHAPTER THIRTY-FIVE

Beverages

BEVERAGES IN THE MENU
- COFFEE
- TEA
- COCOA AND CHOCOLATE
- COLD BEVERAGES
- ALCOHOLIC BEVERAGES

GENERAL RULES AND RECIPES FOR BEVERAGES
- COFFEE
- TEA
- COCOA AND CHOCOLATE
- MILK-AND-EGG BEVERAGES
- FRUIT BEVERAGES
- WINE BEVERAGES

BEVERAGES IN THE MENU

In the opinion of most persons, a meal is incomplete without a beverage, which in its simplest form may be a glass of cold water, chilled with ice if desired. This is usually part of the service of the invalid's tray, even if an additional beverage is served, unless there is some reason for limiting liquids in the diet. The old prejudice against drinking water with the meal has been overcome, although water or other cold beverage should be sipped rather than taken in gulps to wash down food, which in this case may not be properly chewed.

With few exceptions, everyone enjoys a hot beverage on the breakfast table. Usually coffee is the choice, and it may also be the preference with other meals. Some persons prefer tea at breakfast, but it is more commonly used at other meals. Cocoa is a good choice for the children's breakfast, especially if a cold rather than a hot cereal is served. A few older persons take cocoa for breakfast, and may enjoy it, as will the children for lunch or supper. For most children, however, milk is the indispensable beverage at every meal.

Coffee and tea have no food value unless served with cream and sugar. Cocoa in itself will increase the food value of the milk which is used in its preparation. Coffee, tea and cocoa all have a certain amount of stimulating power. Generally this is an asset, especially at breakfast time.

A cold beverage other than water may be used at any meal, with the exception of breakfast, especially in warm weather. Iced coffee, tea or cocoa, a carbonated beverage or a fruit drink usually is chosen. These beverages, however, are used all the year round between meals as a refreshment. Milk, eggnog and other cold beverages made with milk or with milk and eggs are valuable for serving between meals when the caloric or protein content of the diet needs to be increased. Wine and

other liquors, which are used occasionally to provoke appetite or to stimulate or flavor, furnish additional calories.

Hot beverages should be really hot when they reach the patient and cold beverages really cold. The former is particularly important, as a lukewarm cup of a beverage which is supposed to be hot may ruin the enjoyment of what otherwise would be a good meal.

Coffee

Coffee is obtained from the berry of a tropical tree which bears fruit all the year. The beans are removed from the berry, dried, cured and hulled before they are sent to be roasted in the countries where the coffee is to be consumed.

Blends of various kinds of coffee are used to produce the special aroma and flavor typical of an individual brand. The period of time allowed for roasting also affects the flavor. The roasted beans must be ground in order to allow the water to come in contact with as large a part of the coffee substance as possible. The fresher the grind, the better the flavor of the beverage. As coffee is seldom ground at home today, it should be purchased either freshly ground or in vacuum containers. After a container is opened and the coffee comes in contact with air, loss of flavor begins. It has been found that loss is delayed by keeping coffee in a cool place. Theoretically, the finer the grind, the greater the flavor released. The choice of "regular" or drip-grind coffee will depend upon what type of coffeepot is used.

The coffee berry in its natural form has some food value and is still used in certain Eastern countries as a food ration when powdered, mixed with fat and made into balls. In beverage form, as taken in the United States, however, it merely provides stimulation. Among its soluble constituents is caffeine, amounting to about 1.24 per cent. Caffeine is a stimulant which acts upon the heart and the nervous system. It is not, like most other stimulants, followed by depressing effects. Its effect, however, upon the individual is variable, as some persons are exceedingly sensitive to its stimulating quality, while others are less affected. While authorities differ concerning the harmfulness of the moderate use of coffee by adults in good health, all agree that it never should be given to children.

Caffeine may be removed to the extent of 95 per cent or more. Decaffeinated coffee is marketed under several trade names. It retains the coffee flavor and is prepared in the same way as other coffee. Decaffeinated coffee is often prescribed by physicians.

Tannin is another of the soluble products which may be found in the decoction. Unlike caffeine, which is so soluble that it dissolves quickly when liquid comes in contact with ground coffee, tannin requires several minutes for its complete extraction. Long boiling or standing on the grounds brings out a characteristic bitter flavor.

The ordinary cup of coffee, as it is made in the United States, contains from two to three grains of caffeine. Strong coffee may contain as high as four grains per cup; but the amount of tannin will depend largely upon the method by which

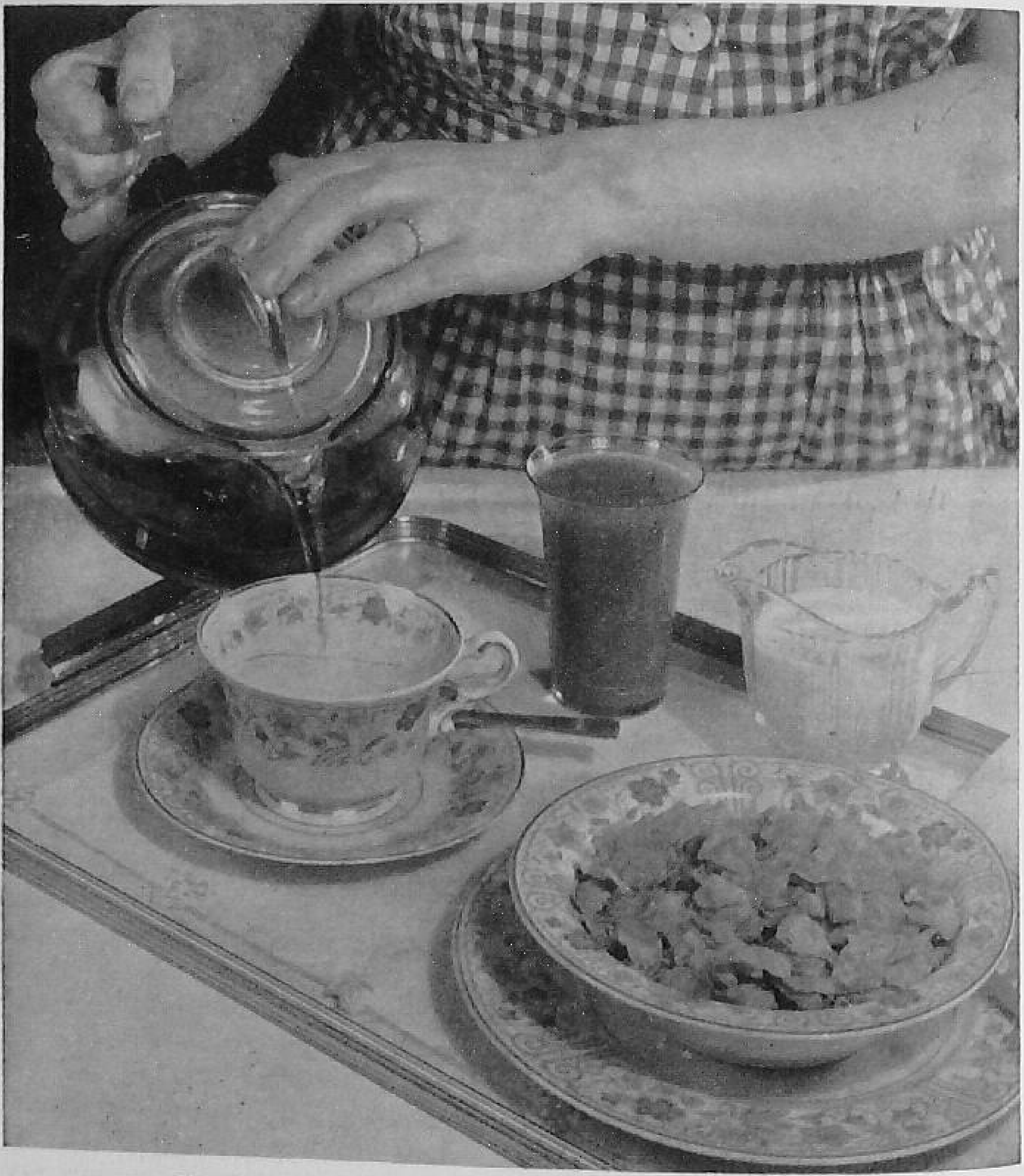


FIG. 74. Coffee should be poured after the tray is ready.

it is made, as it increases with prolonged cooking.

Making Coffee

Four different methods, each adapted to the type of coffeepot, are in general use. Coffee of a "regular" grind should be used for boiling and percolating. A finer grind, known as drip-grind, is for drip and vacuum pots. Experiments by the Massachusetts Institute of Technology show that the temperature of the water is of great importance, and that a temperature less than boiling during the period while the coffee is in contact

with the water produces the best flavor. When boiling water is used in a drip coffeepot, the contact with the cold coffee decreases the temperature to the proper point. For fine flavor, the drip method is recommended. Research by Leslie H. Backer, of the Stevens Institute of Technology, shows that a drip beverage never should be poured through the grounds a second time. Flavor may actually be lost by a second dripping. Professor Backer's experiments showed that water should not be in contact with ground coffee longer than five minutes, regardless of the method used. The reason for this is that while about 25 per cent of the coffee is soluble in water, not more than 85 per cent of the soluble portion should be extracted for a beverage of the finest flavor.

All research in brewing coffee shows the importance of a clean pot. It is not difficult to remove all traces of coffee oils when a glass, pottery or enamel pot is used. A metal pot absorbs the oils. Therefore, it should be thoroughly washed in soapy water and the spout scrubbed with a brush. After rinsing in hot water, there should be no detectable odor of coffee. If a metal pot is not so washed, the oil of the coffee may be absorbed by the porous metal, become rancid and spoil the flavor of a fresh brew. Coffee prepared in a metal pot should be served as soon as it is brewed, as the flavor changes very quickly.

Soluble coffee, often known as "instant," is becoming more and more popular, as the flavor and sometimes the aroma of the product have been improved. It is also available in the decaffeinated form. Soluble coffee, as the name implies, for hot serving needs only to be dissolved in boiling water. Cold water may be used for the preparation of iced coffee. Frozen concentrate of coffee is now available in some markets. This is particularly satisfactory for iced coffee.

Tea

Tea as a beverage is the infusion made from the leaves of *thea*, an evergreen bush. The shrub is not allowed to grow to a height to exceed 5 feet. The leaves are lance-shaped and vary considerably in length. The smaller and the younger leaves produce the more delicate flavor and, therefore, demand the higher prices. The very tender young leaves at the end of the branches make Orange Pekoe or Flowery Pekoe tea. Flowery Pekoe is scented, the scent being produced by allowing certain fragrant flowers to be held in contact with the tea during the process of preparation for the market. Orange Pekoe is so called because the infusion made from it is orange in color. The next larger leaves are called Pekoe; the next Souchong; and those still longer are Souchong, No. 2 or 3, the ordinary varieties of tea.

After the leaves are gathered, they are put into trays or upon shelves and allowed to dry or wither in order to reduce the amount of moisture in them. They are then twisted by being passed through rollers to extract more of the moisture. The leaves, as they come forth from the rollers, twist or roll, which gives the process the name. The masses of rolled leaves are then broken up, and, if green tea is desired, they are then fired.

For this purpose they are spread thinly upon trays and placed in a current of hot air until thoroughly dried. They are then cooled and sifted or sorted according to sizes, when the tea is ready for packing.

If black tea is desired, the leaves are fermented before they are fired. This is accomplished by spreading wet cloths over the leaves and then allowing them to ferment until they attain a copper color, the color which is desired after the infusion is made. Successful fermentation requires much experience, as the tea may easily be spoiled by overfermentation. The difference between green tea and black tea, then, is simply that one is fermented and the other is not. Oolong teas are a cross between green and black teas, although they are ordinarily classed as black teas; they are fermented only slightly so that they partake somewhat of the flavor of the black tea, but have more of the color of the green tea.

A soluble or "instant" tea is available and has found its most popular use in the preparation of iced beverages. While it may be used in the preparation of a quick cup of hot tea, it is not always acceptable to connoisseurs, who have decided preferences in regard to the type and the quality of tea in leaf form.

Tea contains practically the same constituents as does coffee. The principal ingredient is theine, similar to caffeine. Tannin is likewise found, as well as a small amount of an essential oil which gives it tea flavor and aroma. It is important that tea should be made just before serving. According to Hutchinson, an English author, one cup of tea as ordinarily made "contains about one grain of caffeine and twice or three times as much of tannic acid." This statement probably refers to the way it is made in England, where it is usually stronger than in this country. The physiologic effects of tea are much the same as those of coffee. Most persons, however, seem to be less susceptible to the effects of tea than to those of coffee.

Herb Teas. Infusions of various herbs are used in beverages and called tea. With the exception of maté, from a South American shrub, they are generally lacking in stimulation but are pleasant and refreshing.

Making Tea

Tea-making should be done with a view to extracting as little of the tannin as possible while at the same time extracting the flavor. Therefore, the water should be boiling when it is poured on the leaves, and the pot containing the tea also should have been heated previously in order not to reduce the temperature of the water. Fresh cold water should be brought to boiling point and poured *immediately* over the leaves. The infusion should not be allowed to stand for more than five minutes, when it should be turned into another pot; or the tea may be tied in a cheesecloth bag and removed from the pot after brewing. The use of tea already packed in cloth or paper bags is increasingly popular because of its convenience.

Cocoa and Chocolate

Cocoa and chocolate are produced from cocoa beans, which grow in pods from about 5 to 8 inches long upon a tropical (or subtropical) tree

known as the *Theobroma cacao*. When the pods are ripe the beans are removed from them and deposited in boxes or holes in the ground to ferment. They are stirred occasionally to prevent overfermentation. When thoroughly sweated they are removed, spread upon floors or shelves and allowed to dry, whereupon they acquire the reddish tint so much desired. When thoroughly dried they are put into bags and are ready for the market.

In manufacturing plants the cocoa beans are cleaned, sorted and roasted thoroughly. The roasting process is a very delicate one, as overroasting spoils the flavor. They are then cracked, the cracked beans being sometimes known as cocoa nibs. Afterward, they are ground. This reduces them to a thick, oily liquid that is run into molds and allowed to cool, and forms the familiar bars and cakes of bitter chocolate. If a sweet chocolate is desired, sugar is mixed with the mass before it is allowed to cool. If cocoa is desired, some of the oil or butter is removed before the liquid cools so as to produce a less rich mixture. Approximately one-half of the fat is removed from the ground bean. After cooling, the remainder is ground and bolted, the result being cocoa, a soft, floury powder which is put up in cans for the market.

Cocoa is less rich in fat than is chocolate and is therefore often more desirable in illness. Chocolate and cocoa, unlike tea and coffee, have a high nutritive value. The roasted beans, and likewise the bitter chocolate, contain approximately 50 per cent fat, about 18 per cent protein, 10 per cent starch and 7 per cent sugar. Like tea and coffee they also contain a stimulant and tannin. The stimulant, known as theobromine, belongs to the same group of chemical substances as does caffeine and has approximately the same physiologic effects, though not to such a marked degree. It is thought also that the tannin in chocolate is in a less objectionable form than in tea and in coffee. Since only a small amount of cocoa or chocolate is used in making the beverage, there is only a small amount of stimulant in one cup; and the chief nutritive value of the drink lies not in the cocoa but in the amount of milk and sugar used with it. Because of the stimulating quality, however, cocoa as a beverage should be given to children in very weak form. Cocoa should not be confused with Coca-cola, which is the product of a different plant and contains considerable caffeine.

Making Cocoa

In preparing cocoa as a beverage, the easiest way is also the most satisfactory from the standpoint of the resulting product. Place the desired amount of cocoa in a saucepan and add cold water to cover. Boil over direct heat, stirring until the mixture is smooth and has begun to thicken as it boils. Add cold milk and sugar, heat until foamy and beat with an egg beater to prevent the formation of the milk "skin." Cocoa, unlike tea and coffee, may be made several hours before it is to be used, and it will improve in flavor if kept heating over hot water (as in a double boiler) until served.

An "instant" sweet cocoa mix can be used for both hot and cold beverages, and it is convenient to have on hand. Certain brands contain dry

milk solids as well as sugar, others are merely sweetened. Water or milk should be added according to the directions on the package.

Cold Beverages

Cold beverages may be used with meals or between meals. They are more appetizing when chilled, but care should be used in serving an iced beverage to a bedfast patient.

Fruit juices, freshly squeezed, canned or diluted frozen concentrates, are general favorites and are usually allowed. Sometimes combinations of beaten egg with fruit juices are given. Eggs may be combined with milk, sweetened and flavored for a variety of so-called eggnogs. Milk in its usual form, or as buttermilk or acidophilus milk, is the staple beverage in the invalid diet. Malted milks of various flavors may be used. Evaporated milk shaken with fruit juices and cracked ice is useful in some cases where it is difficult for the patient to take fresh milk. Sometimes effervescing waters or ginger ale are well taken by invalids. In certain cases they are specifically ordered. Iced tea, coffee and cocoa may be used between or with meals in some conditions. The choice of beverage will depend largely upon whether it is given for its food value or merely as refreshment. In any case, a cold drink served between meals adds interest to the monotonous hours in the daily routine of the invalid.

Alcoholic Beverages

Alcohol is the product of fermentation of sugar: sugars found in such foodstuffs as fruits or sugar produced from starch by a malting process. Alcoholic beverages are of two types: those which are produced by fermentation only, such as ale, beer and most wines; and those in which the fermenting substances are distilled to yield a distillate with a higher percentage of alcohol than can be secured by fermentation only. In alcoholic beverages, the alcoholic concentrations are often increased by fortification or rectification, i.e., by the addition of alcohol or strong alcoholic distillates (neutral spirits). By such procedures the alcoholic content of wines which are not distilled may be as high as from 20 to 24 per cent.

Since Federal, and sometimes state, taxes are based on the alcoholic content, the exact amount must be stated on the label of a retail product of a given manufacturer. It may be stated as percentage of alcohol: e.g., muscatel, 20 per cent, or as "proof alcohol" content. By this latter method 50 per cent alcohol is called 100 proof, and a whisky labeled "90 proof" would contain 90 per cent of 50 per cent alcohol or 45 per cent pure alcohol. For general use the table on page 433 may be used.

For a time considerable importance was attached to the value of alcohol as a food, owing to the fact that alcohol, when burned, yields energy as heat, although it is not capable of being stored in the body as other food constituents are. For this reason it formerly was used sometimes in diabetic diets as a source of heat in place of the starches and the sugars. In cases of collapse alcohol may act as a quick restorative. Like drugs, it never should be given to patients unless it is prescribed by the physician.

In its own form, wine, and most commonly sherry or port, is used in the invalid diet. Sherry, brandy, whisky and rum are used most often as flavorings for such beverages as eggnog and fruit drinks. Beer or ale may be prescribed in certain high-calorie diets, especially when for some reason milk cannot be taken. It should be noted that these beverages compare with milk merely in caloric value.

GENERAL RULES AND RECIPES FOR BEVERAGES

Coffee

A patient who is fond of coffee will be even more critical than usual with regard to it during illness or convalescence. The use of fresh coffee is important (see p. 428), as is the "grind," which should be suited to the type of pot. If possible, a small drip pot should be used to

Alcoholic Beverages*

	Average Portion	Cal. per Portion	Alcohol per cent	Carb. per cent	Range of Alcohol per cent
Distilled Liquors					
Benedictine	20 cc.	80	42	30	35–50
Crème de menthe	20 cc.	74	36	30	35–50
Brandies	20 cc.	65	45	Sugar sometimes added	35–50
Rum	50 cc.	153	44	....	40–50
Whiskies	50 cc.	145	42	....	40–58
Gin	50 cc.	140	40	....	35–50
Wines					
Champagne	135 cc.	112	10	1–4	9–12
Red	120 cc.	95	12	....	10–16
White	120 cc.	89	12	....	10–16
Port	30 cc.	45	17	3–5	15–20
Sherry	30 cc.	42	17	3	15–22
Malt Liquors					
Ale	250 cc.	155	6	5	3–6
Beer	250 cc.	90	4	1	3–8
Cider					
Sweet	250 cc.	70	1	5	1–6
Fermented	250 cc.	130	5	0–13	1–6

*The above table is compiled from a number of authentic sources. There are, of course, differences in composition of various brands, as indicated by the range of alcohol. When it was possible to obtain more than one analysis, average figures were used.

make coffee, especially for the invalid's tray. A proportion of two level tablespoons to three-quarters of an 8-ounce measuring cup of water is now the accepted proportion. For certain heavier types of coffee, the proportion of water may be increased to 1 cup. A patient may prefer a brew weaker than this. The fineness of the grind also affects the strength of the coffee. A medium "regular" grind is chosen for the boiling and the percolating methods of coffee making, while a finer grind labeled "Drip Grind" should be used for drip and vacuum pots. For after-dinner coffee a double measurement of coffee is generally used.

Boiling. Pour freshly boiling water on the coffee and let it come to the boil. Settle with a little cold water, and set aside to steep for two or three minutes. Broken egg shells may be mixed with the ground coffee before water is added.

Percolating. Pour freshly boiling water over coffee after it has been put in basket. Set over heat, let boil several minutes after beverage begins to bubble in the glass top. Do not overpercolate. Remove basket containing grounds.

Drip Method. Heat pot by rinsing with boiling water, or by allowing the separate sections, including cover, to heat a round utensil in which water is being brought to the boil. Adjust basket over lower section and measure coffee into it. Adjust upper section of pot and add measured amount of boiling water. Set in warm place or place in a shallow pan containing boiling water. When beverage has finished dripping, remove upper sections and re-cover lower pot.

Vacuum Method. Boil water in lower portion of coffee "machine." After water boils, adjust upper sections and add coffee. Continue boiling and when water rises into upper section, stir 30 seconds, first in one direction and then in the other. Remove pot from heat but keep in warm place until beverage has all returned to lower pot. Remove upper section. If the coffee-maker demands the use of a filter cloth, wash and keep under water when not in use.

Care of Coffeepots. Rinse well immediately after use and wash in hot soapy water. Scrub spout with brush. Rinse with hot water and dry. Wash metal pots so well that no coffee odor remains. Dark stains on the inside indicate that the pot was not thoroughly cleaned each time after being used.

Decaffeinated Coffee

Procedure: Decaffeinated coffee almost caffeine-free is available in vacuum cans and may be prepared by any of the foregoing methods.

Instant Coffee

Procedure: Soluble powdered coffee dissolves instantly in boiling water and is usually prepared by the cup, which should be heated before the coffee and the boiling water are poured into it. A caffeine-free powdered coffee is also available.

Iced Coffee

Procedure: Prepare coffee by any of the above methods, using a double proportion of coffee to water, then pour over chopped ice in a tall glass. Add more ice if necessary, and serve at once with powdered sugar and plain or whipped cream.

TEA

Tea

Procedure: The proportion of 1 teaspoon of tea or 1 tea ball to 1 cup water is generally used.

Heat the teapot by pouring boiling water into it a few minutes before it is needed. Empty, and put tea into the pot. Pour over it water that has just come to a boil and let stand for from 3 to 5 minutes, then serve with lemon, sugar and cream or milk, as preferred. A covered pot of boiling water always should be served with the pot of tea on the tray in order that it may be diluted if weak tea is preferred. As a variation, tea may be served occasionally Russian style in a tall glass garnished with sliced lemon.

Iced Tea

Procedure: Follow directions for making tea, using 2 teaspoons tea to each cup boiling water. After tea has steeped, pour over chopped ice in a tall glass. Add more ice, if necessary, and serve at once, with quartered lemon and powdered sugar. The glass may be filled to half its depth with tea, to which, after it has chilled, ginger ale may be added.

COCOA AND CHOCOLATE

Cocoa

Ingredients:

- 2 teaspoons cocoa
- ⅓ cup cold water
- ¾ cup milk
- 2 teaspoons sugar

Procedure: Mix cocoa and water, stir over low heat until smooth. Boil 1 minute. Add milk and sugar, heat and beat until foamy with a rotary egg beater to prevent the formation of a scum. If preferred, 2 to 3 tablespoons cocoa syrup (see below) may be stirred into 1 cup hot milk. Serve with whipped cream. Yield: 1 serving.

Chocolate

Procedure: Follow directions for cocoa, substituting ⅓ square unsweetened chocolate cut in small pieces for the cocoa.

Iced Chocolate or Cocoa

Procedure: Follow directions for cocoa or chocolate and cool. Pour over chopped ice in tall glass and serve with whipped cream.

Iced Mocha

Procedure: Combine equal parts of iced coffee and iced chocolate. Flavor with vanilla extract or powered cinnamon to taste. Serve in tall glass with whipped cream.

Cocoa Sirup

Ingredients:

- ½ cup cocoa
- 1 cup cold water
- 1 cup sugar
- ⅛ teaspoon salt
- ½ teaspoon vanilla extract

Procedure: Mix cocoa and water in 1½-quart saucepan and stir over low heat until mixture thickens and boils. Add sugar and salt, stir until dissolved. Boil 3 minutes, add vanilla extract, pour into pint jar and seal. After opening, store in refrigerator. This sirup will keep indefinitely, and may be used as a flavoring for milk drinks or as a sauce for puddings and ice creams. Yield: 1 pint.

MILK-AND-EGG BEVERAGES

Eggnog

Ingredients:

- 1 egg
- Salt
- 1 tablespoon powdered sugar
- ¾ cup milk
- 1 tablespoon brandy

Procedure: Beat egg thoroughly. Add salt and sugar and beat until dissolved. Stir in milk and add brandy. Serve in glass and sprinkle with nutmeg if de-

sired. The egg white may be beaten separately, if desired, and folded in just before the eggnog is served. Yield: 1 serving.

Chocolate Eggnog

Procedure: Follow directions for eggnog (see above) substituting 1 tablespoon cocoa syrup (above) and ⅛ teaspoon vanilla extract for brandy.

Molasses Eggnog

Procedure: Follow directions for Eggnog (p. 435) substituting molasses for powdered sugar.

Orange Eggnog

Ingredients:
- 1 egg yolk
- 2 teaspoons sugar
- ½ cup orange juice
- 1 teaspoon lemon juice
- 1 tablespoon cream
- 1 egg white

Procedure: Beat egg yolk until foamy and stir in half the sugar. Add orange juice and lemon juice slowly, then cream. Beat egg white until stiff, add remaining sugar and fold into first mixture. Yield: 1 serving.

Malted Milk, Hot

Ingredients:
- 4 tablespoons malted milk powder
- ¾ cup hot water

Procedure: Moisten malted milk powder with enough hot water to make a smooth paste, then add remaining water gradually, stirring constantly. A little salt or celery salt may be added as seasoning, or 2 teaspoons sugar and a few drops of vanilla extract may be added as a flavoring. Yield: 1 serving.

Chocolate Malted Milk

Ingredients:
- 2 tablespoons malted milk powder
- 1 tablespoon cocoa syrup
- 1 cup milk
- 2 tablespoons cream

Procedure: Mix malted milk powder and syrup, stir in milk gradually, add cream and beat with a rotary egg beater until well blended. Pour over chopped ice in tall glass. Yield: 1 serving.

Molasses Malted Milk

Ingredients:
- 2 tablespoons molasses
- 3 tablespoons malted milk powder
- 1 cup milk, hot or cold

Procedure: Blend molasses with malted milk powder. Stir in hot or cold milk. Beat with rotary beater and serve at once. Yield: 1 serving.

Milk Shake

Ingredients:
- 2 tablespoons sugar
- 1 cup milk
- ½ teaspoon vanilla

Procedure: Mix sugar, milk and vanilla in a shaker or glass fruit jar. Add shaved ice. Fasten cover tight and shake well. When milk is frothy, strain into tall glass and serve at once. Yield: 1 serving.

Molasses Milk Shake

Procedure: Follow directions for Milk Shake, substituting molasses for sugar. Add cinnamon, mace or nutmeg to taste.

Banana Milk Shake

Ingredients:
- 1 fully ripe banana
- 1 cup cold milk

Procedure: Slice banana into bowl and beat well with fork or rotary egg beater until smooth and creamy. Add cold milk and mix thoroughly or shake. Yield: 1 large-size drink or 2 medium-size drinks.

Banana Milk Shake, Frosted

Procedure: Follow directions for banana milk shake (see above), adding 3 tablespoons vanilla ice cream before serving.

FIG. 75. Banana milk shake.

Molasses Banana Milk Shake

Procedure: Follow directions for Banana Milk Shake (see p. 436) beating in 2 tablespoons molasses and nutmeg to taste.

Milk Punch

Ingredients:

¾ cup milk
1 egg yolk
1 tablespoon sugar

Dash nutmeg and cinnamon
1½ tablespoons rum

Procedure: Scald milk over hot water. Beat egg yolk and sugar together, gradually add hot milk, stirring constantly. Add spices and rum and serve at once. Yield: 1 serving.

Fruit Beverages

Fruit juices are the usual choice for breakfast service. They are much used in their own simple form or as a basis for refreshing between-meal beverages. (For preparation see Chap. 39.)

Orangeade

Ingredients:
1 tablespoon sugar
¾ cup water
½ cup orange juice
1 tablespoon lemon juice

Procedure: Mix sugar and water in a small saucepan, stir over low heat until sugar dissolves. Boil 1 minute and chill. Add fruit juices, pour over cracked ice in a tall glass. Yield: 1 serving.

Lemonade

Ingredients:
1½ tablespoons sugar
1 cup water
2 tablespoons lemon juice

Procedure: Combine sugar and water, stir until dissolved. Add lemon juice, strain and pour over cracked ice in a tall glass. Yield: 1 serving.

Egg Lemonade

Ingredients:
1 egg
2 tablespoons sugar
¾ cup water
2 tablespoons lemon juice

Procedure: Beat egg and sugar together, add water and lemon juice. Strain over cracked ice in a tall glass. Yield: 1 serving.

Mint Fruitade

Ingredients:
1½ cups boiling water
¼ cup sugar
2 mint sprigs, crushed
½ cup pineapple or grapefruit juice
Juice of 1 lemon

Procedure: Boil water and sugar 3 minutes, add crushed mint. (If fresh mint is not obtainable, use 2 tablespoons dried spearmint.) Let stand from 5 to 10 minutes, strain and add fruit juices. Pour over cracked ice in a tall glass. Yield: 2 servings.

Fruit Yoghurt Beverage

Ingredients:
1 container yoghurt
½ can frozen grape or orange concentrate

Procedure: Beat yoghurt with the frozen juice concentrate until blended. Serve in tall parfait glasses or sherbet glasses. Yield: 2 servings.

Canned and Frozen Fruit Juices

Canned and frozen fruit juices can be obtained in great variety and are useful in the diet of the invalid. The canned fruit juices may be served undiluted. The frozen concentrates should be diluted according to directions on the can. Besides orange juice, the first on the market, grapefruit, lemon, grape and pineapple juices are now in distribution. The cans of frozen concentrate should be stored in the freezing unit of the refrigerator until they are to be used. Suggested combinations are: pineapple and grapefruit; orange juice and grapefruit juice; grape and lemon or orange juice; prune with lemon juice. Fruit juices, such as peach, apricot and pear, which are known as nectars, and tomato juice may be served separately or with fresh lemon juice.

FIG. 76. Tomato juice may be chosen as a breakfast fruit or it may be served between meals.

WINE BEVERAGES

Mulled Wine

Ingredients:
- 1 1-inch stick cinnamon
- 3 cloves
- 1 tablespoon sugar
- ½ cup boiling water
- ½ cup white or red wine

Procedure: Combine cinnamon, cloves, sugar and water in a small saucepan and boil 2 minutes; strain. Add hot mixture gradually to wine and heat. Serve hot. Yield: 1 serving.

Wine Cooler

Place ¼ cup white wine in tall glass. Add cracked ice and fill glass almost to top with carbonated water. Garnish with sprigs of fresh mint or with fresh berries or seeded sweet cherries. Yield: 1 serving.

For suggestions for preparation of highly nutritious beverages, see Chapter 50.

STUDY QUESTIONS

1. What beverages are considered to be accessory to a meal? Give the reasons for your choice.
2. Outline the principles of preparing coffee as a beverage.
3. What method is considered best and why?
4. Outline the principles of making tea. Give reasons for the choice of this method.
5. List beverages suitable for serving between meals as refreshment. Which of these would supply a worth-while amount of vitamin C?
6. List beverages which may be taken for additional nourishment.

CHAPTER THIRTY-SIX

Milk

SAFE MILK
COMPOSITION OF MILK
FOOD VALUE
DIGESTIBILITY
MILK IN THE MENU
USE OF MILK IN RECIPES

Milk, although not a perfect food, is the best single food which nature provides and the only animal food biologically intended for food. Each animal provides for its young the food adequate for its growth and its protection during infancy. Cow's milk, designed by nature for the young calf, has become the chief form of milk for human consumption, and the discussion of milk in this chapter will be limited in general to cow's milk. The adaptations which must be made in infant feeding were discussed in Part One, Chapter 13. While milk is particularly important until growth is completed, it is an asset to the diet throughout life. No other food scores so well in so many respects, and it is almost impossible to equal it by any combination of other foods. Because milk is a liquid, some adults think of it as a beverage rather than as a food and fail to recognize its importance in the daily diet.

SAFE MILK

The safety of the milk supply is as important as the safety of the water supply. Many cities and most states have set up standards for cleanliness and bacteria content. All milk must be pasteurized or comply with standards set for what is known as certified milk. Nowhere else in the world is the milk supply as uniformly good as it is in the United States. (See Chap. 16.)

In the absence of a good supply of pasteurized milk, fresh milk should be pasteurized or boiled at home, or evaporated or dry milk should be used. Evaporated and dry milk are sterilized or pasteurized in factory preparation, in the course of which they lose little of their nutritive value. Large quantities of dry milk were manufactured during World War II for shipment abroad, and the consumer now is profiting from the new and efficient methods of preparation which were developed during that period.

Most of the dry milk on the market is in skimmed form and sells at a low price. For this reason, its use has increased immeasurably in the last few years. It is also an invaluable source of nutrients when calories must be limited, as in a reducing diet or when fat must be avoided for any other reason. During manufacture, the curd of both the canned

and the dry milk is broken up, and for this reason the milk is easily digested. For the same reason doctors advise that fresh milk be boiled when used for infant feeding. Sweetened condensed milk has a higher fuel value than other milk because of the large amount of sugar used in its preparation, but because of the high sugar content usually it is not prescribed by the doctor for infant or invalid.

COMPOSITION OF MILK

This liquid which we know as milk is a yellowish-white fluid which is a solution of sugar, proteins, certain minerals and vitamins with fat "held in suspension." The color is due to coloring matter which is contained in the fat and is some indication of the richness of the milk. While a certain minimum amount of fat is desirable and often designated by law, the food value of milk does not depend so much upon that as upon the quality of the proteins, the minerals and the vitamins which are present throughout the whole milk. Contrary to opinion, even skim milk is a more valuable food from the nutritive standpoint than cream. When milk is skimmed, most of the fat and of the vitamin A and a small amount of the riboflavin are removed with the cream, but it still scores high on other counts.

The milk of different breeds of cattle varies as to the amount of the total solids and of fat. The content of each may vary with the season of the year and with the feeding and the care given the animals. Market milk, however, because it is a mixture from different cows, maintains a fairly constant average.

Approximate Average Composition of Cow's Milk

	Per Cent
Protein	3.5
Fat	3.9
Sugar	4.9
Minerals	0.7
Water	87.0

State standards usually take into account both the fat content and the total solids. The requirements in general range from 2.5 per cent to 3.5 per cent for fat content and from 11.5 per cent to 12 per cent for total solids. Most market milk is well above the minimum.

FOOD VALUE

The test of the nutritive value of a food lies in its ability to satisfy the needs of the body.

In nutritive value milk stands high. For fuel purposes average milk gives 666 calories a quart. A two-year-old child needs about 1,200 calories; and the quart of milk which he must have to get the other dietary essentials will give him half the calories that he needs. The fat and the sugar, which with the protein furnish the milk calories, are present in forms which are very easily digested. The sugar is in the form of lactose, which does not ferment readily or cause digestive upsets, and it also aids in preventing the growth of the putrefactive bacteria which develop in the intestines and which sometimes cause digestive disturbances.

The quality of the protein in milk is excellent, which means that it contains the amino acids needed to build new tissue. This is invaluable when it is realized how much new

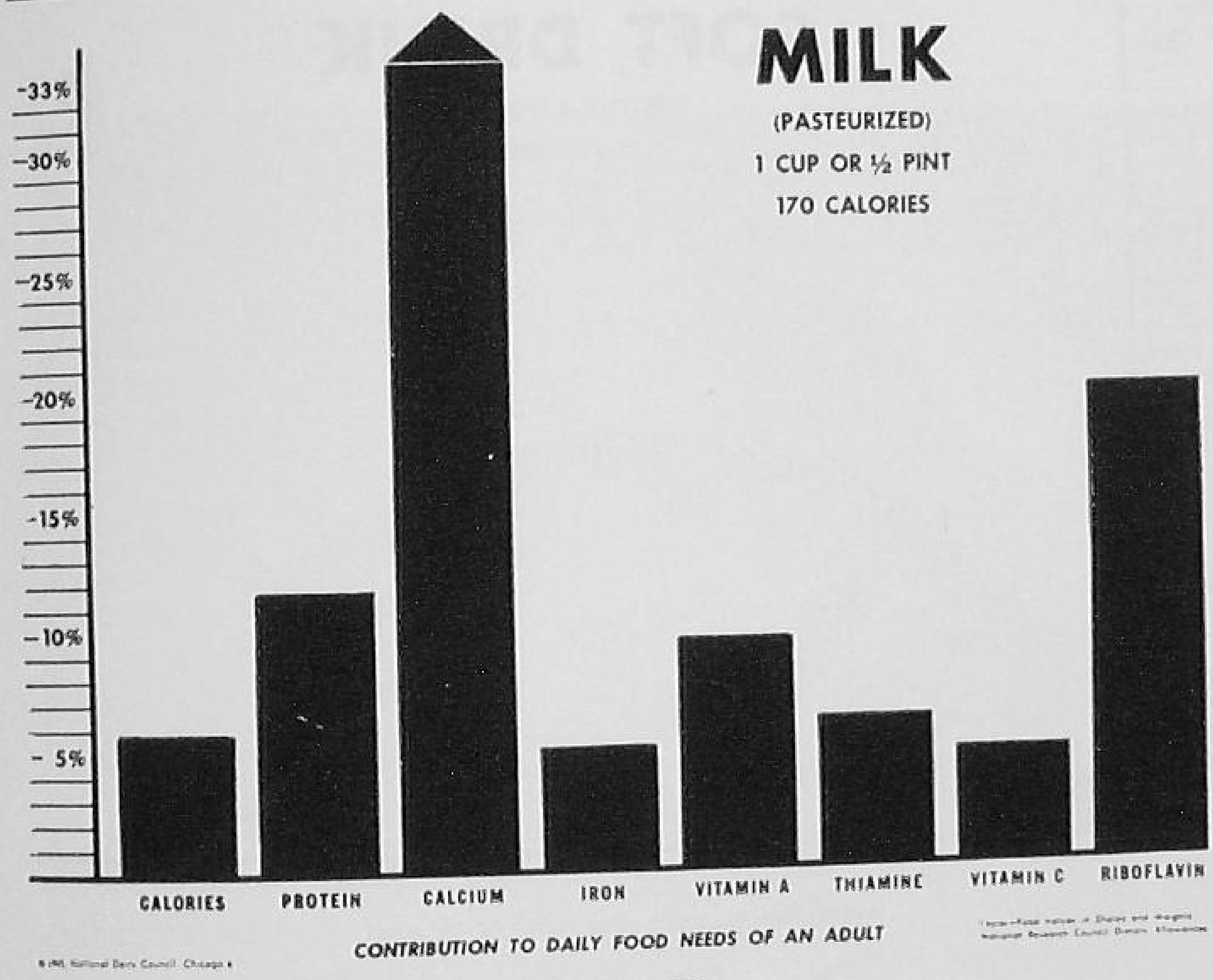


FIGURE 77

tissue a child must build each year until he arrives at maturity. In the first year a baby triples his weight; and, although his rate of growth is less than this as he grows older, he must continue to gain a number of pounds each year. Although diluted cow's milk which is used in infant feeding does not contain exactly the same quantity and types of amino acids as human milk, research reported by Williamson[1] shows that the differences are not significant. The quart of milk which the two-year-old takes will furnish him with enough protein of the best kind. Older children will get more of their protein from other sources. Adults should get some of the amount they need from milk as well as from other sources. It is also important to note that the protein in milk will supplement that of the cereals, and in this way give these economical foods a higher value.

The mineral substances found in milk are important. The trace of iron present is easily available. Calcium and phosphorus, necessary factors in forming bone, are furnished in large amounts by milk, on which children depend for an adequate supply dur-

[1] Williamson, J.: Biol. Chem. **156**:47, 1944.

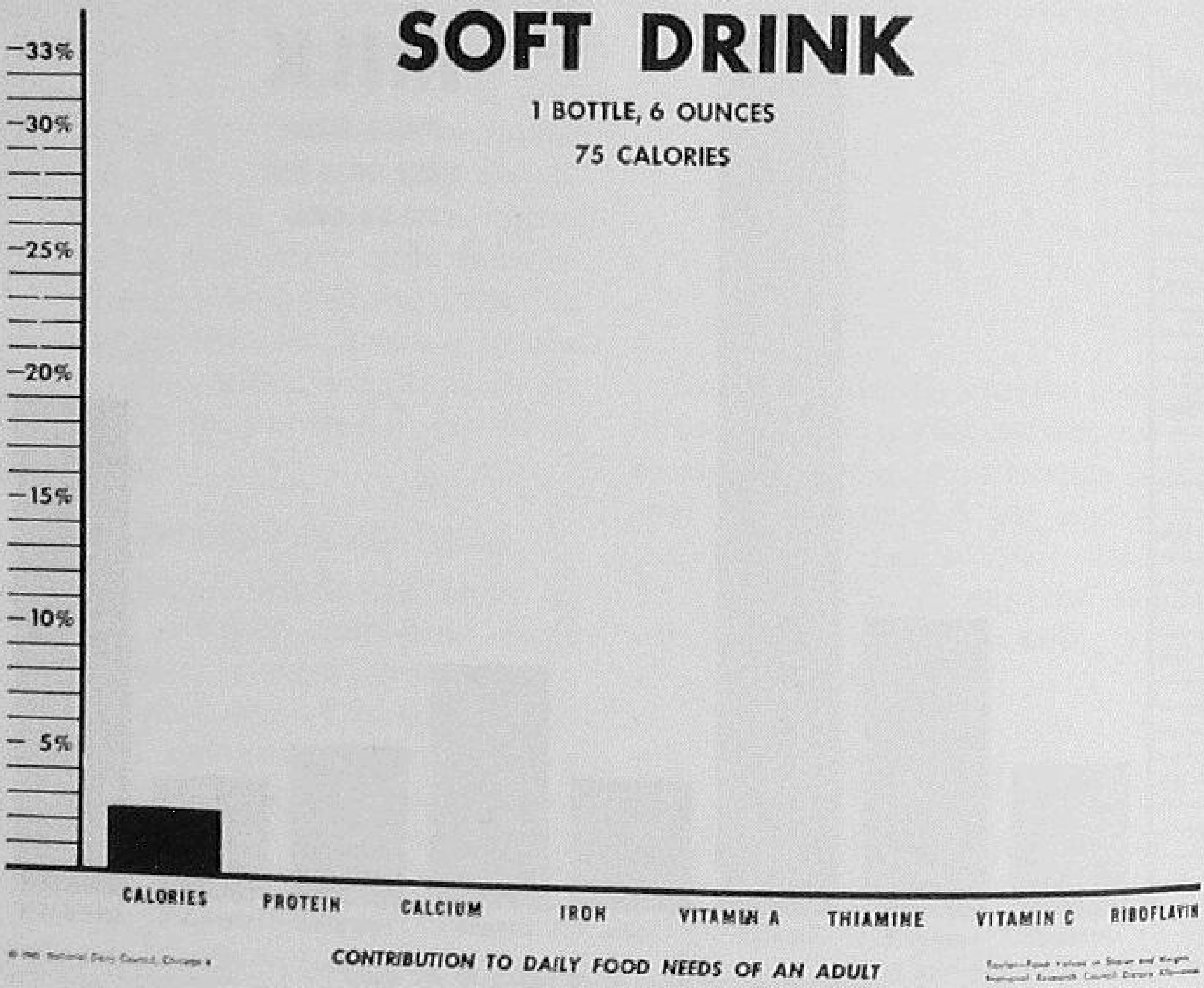


Figure 78

ing the time that the framework of their bodies is being built. A lack of either mineral may cause rickets.

In a series of experiments with children from three to thirteen years of age, carried out by Columbia University, one quart of milk produced optimum storage of calcium. It was observed that even when supplemented with calcium from vegetables, a pint of milk did not produce the same results. However, reports show that optimum storage has been obtained on a pint of milk, but only when the children studied were already in good physiologic condition.

Milk is relatively rich in vitamin A and contributes enough thiamine to make it valuable in a diet where it is used liberally. The riboflavin content ranks with that of cooked meats, the main source of this factor to the diet. Milk also contributes certain amounts of niacin. The vitamin C content is low and is probably influenced by the period of storage. As milk is such an uncertain source of this vitamin, it cannot be counted upon as a major source of supply.

The vitamin D in natural milk is not sufficient to protect children against rickets. However, it is now common practice to reinforce both fresh and evaporated milk with vitamin D. Three different types of milk have been used for this purpose:

FIGURE 79. (National Dairy Council)

(1) "Irradiated" milk, which has been exposed directly to ultraviolet light rays from a carbon arc; (2) "metabolized" milk, produced by feeding the cows irradiated yeast; (3) "fortified" milk, to which a vitamin D concentrate has been added. The third type has proved to be the best, and is in general use, as the proper concentration may be obtained without injuring flavor.

If milk is compared with other foods, the conclusion will be drawn that no other food provides a better selection of nutrients.

Cream has a fat content of from 18 to 40 per cent, depending upon whether it is sold as "light" coffee cream or "heavy" whipping cream. As the fat increases, most of the other nutrients decrease. It is used generally for flavor. Whipped cream, when used as a garnish, contrasts favorably with the flavor and the texture of the dessert or soup with which it is served. Comparing food value with cost, it is much more expensive than milk. In the high-caloric diet it may be useful if the fat is well tolerated.

DIGESTIBILITY

Because milk has a high food value and is so easily digested, usually it is an important factor in the diet of the sick. Often it may be prescribed for persons who have been unable, or who have thought they were unable, to take it as a beverage. Sometimes because it is "doctor's orders" a patient will give milk a fair trial and find he is able to digest this liquid food. Homogenized milk, prepared by a process which reduces the size of the fat globules and makes a more perfect emulsion, is often tolerated better than regular milk.

Sometimes it may be necessary to prepare milk specially: for example, to boil it, which makes a smaller curd for digestion, or to mix it with carbonated waters. In some cases evaporated or dry skim milk drinks flavored with orange juice or cocoa will be taken more easily than fresh milk because of the difference in flavor and in texture. Buttermilk may be preferred to milk in other liquid form and is comparable with skim milk in nutritive value. If liquid milk in any form is not well taken, dry milk can be incorporated into sandwich fillings or a double amount can be used in soups, sauces and puddings.

Other products which sometimes can be used successfully are yogurt and junket. In the former the milk is thickened by the use of the acidophilus culture, and in the latter it is set by the use of rennet. Still other milk products which may be found useful are cream and cottage cheese.

MILK IN THE MENU

Milk a Necessity. It is not hard to convince the majority of people that children must have milk in their diet, although the importance of an adequate amount is not always realized. It is not so easy to persuade adults that they, too, need milk. Even if they are getting an adequate supply of protein from other foods—and this is difficult without the use of milk—the mineral and the vitamin contribution is important.

Objections to Milk. Two objections by uninformed persons to the

use of milk are often heard. It is believed to be both constipating and fattening. The first objection may be met by encouraging the use of more laxative foods; the second by suggesting that a glass of milk be taken instead of a second slice of bread or a second helping of dessert. In a reducing diet it is important that some milk be included, as when the amount and the variety of food are cut down, special care must be taken to supply the minerals and the vitamins.

How Milk May Be Taken. Milk may be taken in the form of custards, soups, cocoa and other milk dishes; fortunately, milk in such forms is as nutritious as when taken as a beverage and often it is more easily utilized. When a specific sensitivity to milk exists it may have to be omitted, but in that case special care should be taken to keep the diet adequate. Sometimes milk in canned or dried form or boiled fresh milk can be taken by those who are allergic to fresh milk. It should be noted also

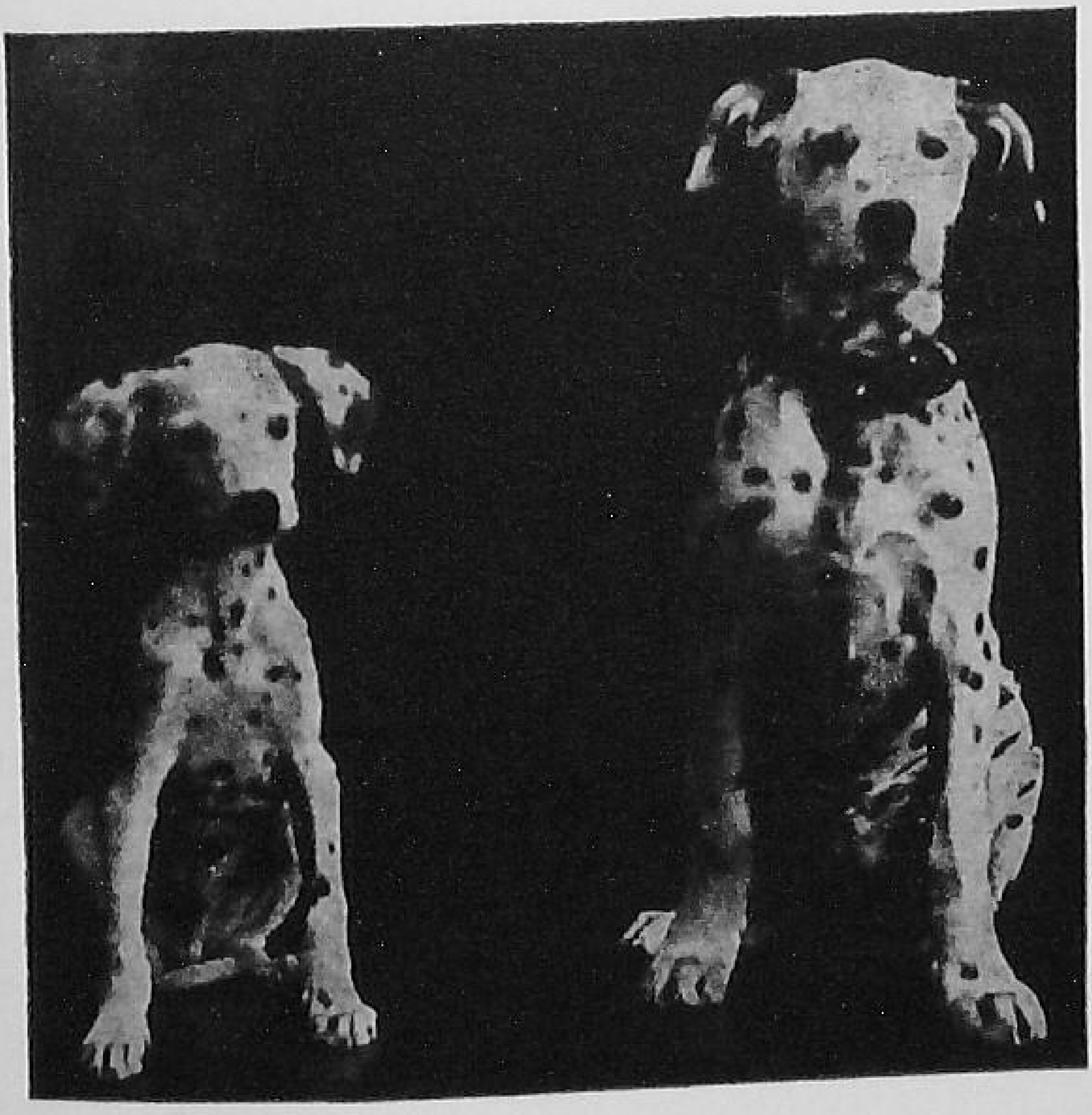


FIG. 80. Two puppies of the same age. The larger one had an abundant supply of milk; the smaller one had little milk but plenty of other food. (The Shattuck Farms, Andover, Mass.)

that milk in canned and in dried form is convenient and economical for use in general cookery.

Summation of Value of Milk. The value of milk in the diet of the family may be summed up as follows:

Milk contains more food essentials in better proportions than most other foods.

Milk is an excellent source of both calcium and phosphorus.

Though milk contains only a small amount of iron, that amount is in an easily available form.

Milk proteins are of the best quality for tissue growth and repair, and are especially valuable as a supplement to the incomplete proteins of grains.

The fat of milk is in an emulsified form and is easily digested.

The only carbohydrate in milk—lactose—is available as a fuel food. It increases calcium absorption from the intestine and inhibits putrefaction in the colon.

Milk is a good source of vitamin A and riboflavin, and contributes thiamine. It is also an excellent carrier of vitamin D when fortified.

Milk should be considered a necessity, not a luxury, because it furnishes more of the protective food factors for the money than any other food.

USE OF MILK IN RECIPES

Milk is an ingredient in innumerable recipes, such as those classified under Beverages, Desserts and Soups and in other chapters. When used either by itself as beverage, or as an ingredient of a cold beverage, it is usually desirable to have it chilled. When it is to be served hot, either by itself or as an ingredient, general practice is to place it in the top of a double boiler and heat over hot water. This prevents scorching, which injures flavor. Even in a double boiler, milk should not be overheated, as this causes the formation of scum. If scum forms, it may be beaten into the milk with a rotary egg beater.

STUDY QUESTIONS

1. Should milk be considered an almost perfect food? Compare the contributions of ½ pint milk with a 6-oz. bottle of a soft drink.
2. The importance of a safe milk supply is recognized. What forms of milk are safe to use?
3. Discuss the digestibility of milk. If it is not well taken in fresh form, how can this difficulty be overcome?
4. Outline the reasons for use of milk in the family diet.
5. List ten recipes in which a large amount of milk is called for.

CHAPTER THIRTY-SEVEN

Fats, Sweetenings, Seasonings and Flavorings

FATS
- BUTTER
- MARGARINE

SWEETENINGS
SEASONINGS AND FLAVORINGS

Fats, sweetenings, seasonings and flavorings are grouped together in this chapter because of their importance in cookery and their contributions to the preparation of good meals. When they are used in combination with other ingredients, they have one or more functions, the most important perhaps being the property which they all share of tying together other foods so that texture or flavor, or both, may be interesting. All these products are used as ingredients in recipes, and some of them have a place on the table as accessories to other foods. Among fats, for instance, butter and margarine have a large use as spreads for bread, when their function is somewhat the same as when fat is used as an ingredient of a recipe. Sugar, honey and sirup among sweetenings and salt and pepper among seasonings have common use as accessories at meals.

From the standpoint of nutrition, fats, sugar and other sweetenings which have a high fuel value differ completely from the majority of seasonings and flavorings which seldom have any nutritive value. The individual contributions of all these assets to food preparation will, therefore, be discussed under separate headings.

FATS

For their weight, fats have the highest fuel value of any food. They are concentrated sources of fuel and energy. Butter and fortified margarine differ from other fats in that they supply valuable amounts of vitamin A which most fats and oils lack.

Fats are classified roughly as hard or hardened fats, which include table spreads and shortenings, and as liquid fats, which are known as oils and have their largest use for frying and as an ingredient of salad dressings. With the exception of butter, margarine and olive oil, fats generally are bland in flavor. These bland fats generally are less expensive than those with flavor, and it is economical to make use of them in recipes when other ingredients provide the appetite appeal.

All hard fats, including butter,

Vitamin A Potency of Creamery Butter Produced During the Winter and the Summer Months in 14 States

Region and Participating State	Average Yearly Butter Production			Average Vitamin A Potency per Pound		
	Total	Winter Months	Summer Months	Winter Butter	Summer Butter	Annual
	Million pounds	*Per Cent*	*Per Cent*	*International Units*	*International Units*	*International Units*
North Central:						
Minnesota	304.4	43.3	56.7	10,808	17,946	14,855
Wisconsin	151.2	34.6	65.4	10,663	18,884	16,039
Ohio	69.5	31.4	68.6	9,698	15,459	13,650
Iowa	241.0	37.4	62.6	10,946	17,434	15,010
Nebraska	93.3	36.5	63.5	11,287	20,667	17,030
Kansas	74.7	37.8	62.2	11,606	15,030	13,768
Total or average	934.1	38.3	61.7	10,863±267	17,810±870	15,150±535
South Atlantic and South Central:						
North Carolina	1.8	29.5	70.5	9,674	16,253	14,312
Louisiana	.8	29.2	70.8	12,283	18,068	16,379
Mississippi	4.0	22.8	77.2	12,014	17,868	16,533
Total or average	6.6	25.4	74.6	11,301	17,471	15,903
Rocky Mountain and Pacific Coast:						
Washington	32.0	17.8	82.2	12,162	19,827	18,467
Oregon	28.2	34.7	65.3	12,899	18,464	16,535
California	43.2	19.0	81.0	15,140	18,968	18,214
Idaho	37.1	37.1	62.9	13,312	18,197	16,384
Montana	12.7	29.7	70.3	18,636	22,018	21,014
Total or average	153.2	26.9	73.1	13,931	19,170	17,754
Grand total or average	1,093.9	35.7	64.3	11,160	17,955	15,529

margarine, lard and hardened vegetable fats, share a characteristic known as shortening power which influences the texture of baked products such as muffins, biscuits, cakes and pastry. Oils have a small use as shortening, but generally they are not as satisfactory for this purpose as are the hard fats.

All types of fat are used for frying, but only liquid fats known as oils are used in the preparation of salad dressings. The distinctive flavor of olive oil gives it preference for use in salad dressings, unless of course this flavor is disliked. Bland oils, which may be a product of corn, cottonseed, peanuts or soybeans, especially the first two, are more largely used than olive oil for dressings in this country.

Butter

Butter is made from milk fat which is known as cream. As some moisture and curd remain after the cream is churned, butter generally contains about 85 per cent fat. This gives it a very high fuel value—about 3,251 calories to the pound. Fat is digested less quickly than protein or carbohydrate and thus gives satiety value to a meal. Butter may have added advantages in certain pathologic conditions—hyperacidity, for instance—because of its nonstimulating and even soothing effect. In some types of maladies there may be a low toleration of fat, but in general butter in moderate amount is well taken.

In addition to its fuel value, butter is an excellent source of vitamin A and may contain some vitamin D. These vitamins are retained with the fat when it is removed from the milk. It has long been known that the vitamin A content may differ under summer and winter feeding conditions of the cows which produce the milk from which it is made. A general survey made by the Bureau of Dairy Industry of the United States Department of Agriculture in regard to the vitamin A potency of about 64 per cent of the creamery butter produced in the United States shows that this may vary from approximately 11,200 to 18,000 international units per pound. The study indicates that the average vitamin potency of the total output of creamery butter is 15,000 international units per pound. The effect upon the vitamin A content of storage and handling has been found to be negligible.

The quality of butter, of which flavor is the common test, has improved greatly under modern conditions of production and handling. It has become the favorite spread and a shortening for fine foods. For this reason it is wise to use it on the invalid's tray when obtainable.

Margarine

Margarine is the term used to cover shortenings which most nearly approximate butter in consistency and in flavor. The use of margarine as a spread as well as a shortening increased greatly during butter rationing and shortage. Public demand has resulted in the repeal of Federal taxes on the product and of restrictions on the sale of colored margarine in interstate commerce. In a number of states, however, restrictions are still in force and prevent as wide a use of it as is desirable, especially in low-income groups.

The repeal of restrictions against the marketing of colored margarine and the attractive packaging in stick form has increased the consumption in states in which it can be purchased. Various brands differ in flavor and in texture, and price generally is in relation to quality.

Results of experiments conducted to show the comparative nutritive value of butter and fortified margarine failed to show any significant differences when they were used in a mixed diet. The fuel value is equal to that of butter. While margarines are almost entirely lacking in natural vitamin content, most of them are now fortified with 15,000 international units vitamin A per pound.

SWEETENINGS

Sweetenings rank next to fat with regard to their caloric content per unit of weight. All sweetenings have a more or less concentrated caloric value in ratio to their concentration. This is highest in sugar and lowest in cane sirup or sorghum. White sugar, which is highly refined, contributes only calories. Brown sugar, maple sugar and sirup, corn sirup and honey have a very small mineral content, but molasses is considered a good source of minerals, particularly iron. Honey and molasses both contribute small and varying amounts of the vitamins of the B complex.

In order of volume the sweetenings used in food preparation and as table accessories are sugar, molasses, corn sirup, cane sirup, honey, maple sugar and sirup. Of these, honey has perhaps the oldest history; except for the Frigid Zones, its production is world-wide. Sap from the maple tree in regions where it is indigenous also has a long history, dating from the time when it was discovered that the trees could be tapped and the sap concentrated by boiling. The juice of the sugar cane also had some use at an early date, but it is only with-

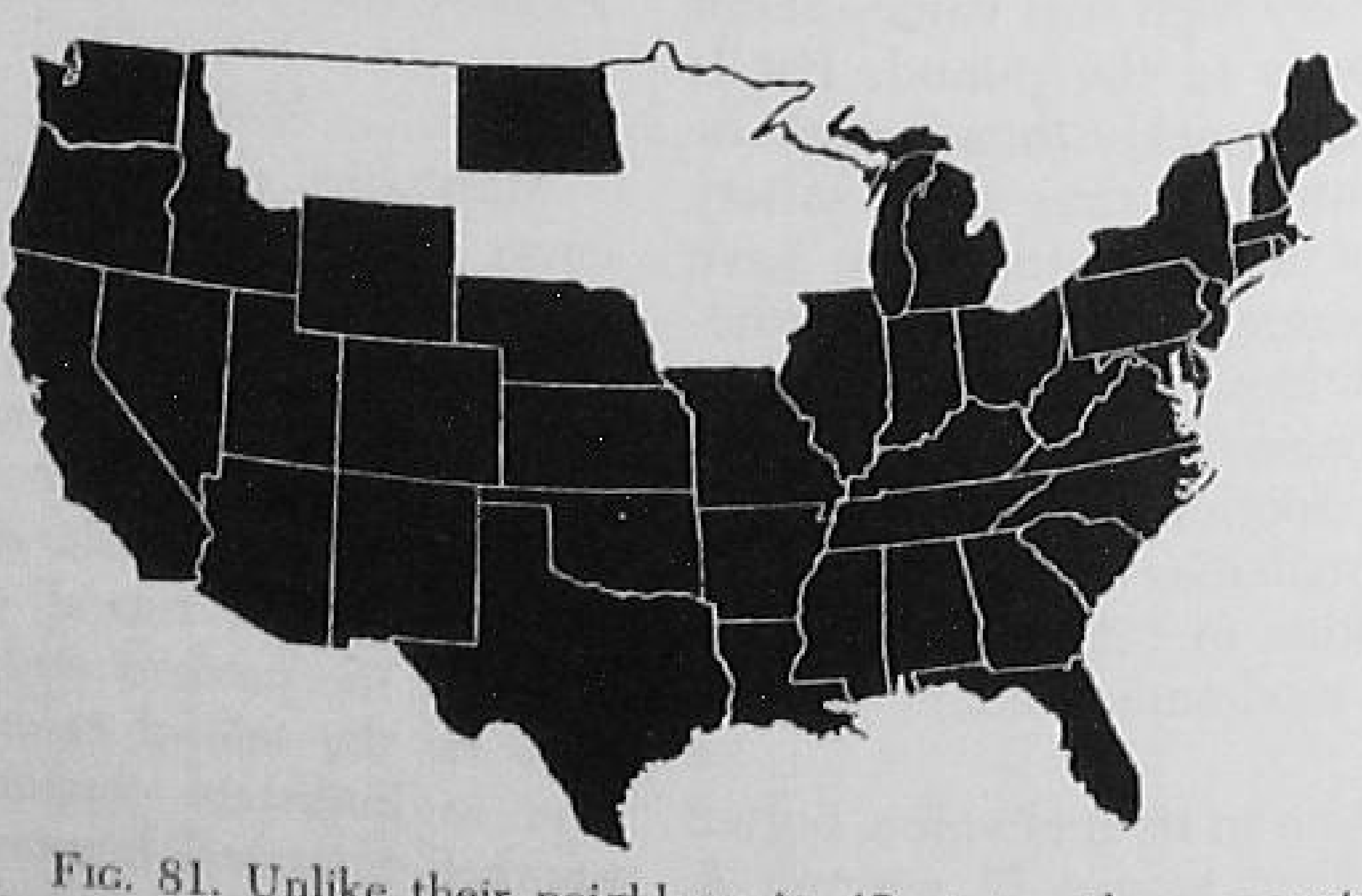


FIG. 81. Unlike their neighbors in 42 states, they cannot buy the yellow product, precolored at the factory at no extra cost. (National Association of Margarine Manufacturers, Washington, D. C.)

in the last few centuries that methods were developed for producing sugar in the many forms in which we know it today. It is only in comparatively modern times that the sugar beet has become a source of the world's sugar supply. It is a still shorter time since methods of extracting sweetening from corn to produce a thick sirup were evolved. A small amount of corn sugar is also produced, most of it for commercial use. Some use of dextrose, a form of corn sugar, is made in the invalid diet when it is desirable to increase caloric value without oversweetening a beverage or a dessert.

Sugar has become the staple sweetening since the large volume of production has made it less expensive than other forms of sweetening. More sugar from cane than from beets is used in the United States. Both types have the same sweetening power. Most recipes which call for sugar indicate the granulated form, although brown sugar is used to some extent. Both granulated and tablet sugar are used for sweetening coffee and tea. Powdered and confectioners' sugar, both fine in texture, have some use in cookery and on the table.

Honey and all forms of syrup have some use in recipes and also as a table accessory for griddle cakes and hot breads. There is some use for corn syrup in preparation of the infant's formula. Molasses is used less at the present time as a spread than as an ingredient in cooking.

All sweetenings have the power of satisfying appetite. This may be an asset or a liability, depending upon how they are used in the diet. The custom of serving a dessert has proven to be good, as it provides the final satisfaction to a meal. On the other hand, sweets should not be eaten to any extent between meals, as they may spoil the appetite for the following meal. For this reason, it is recommended that candy, the most concentrated of sweets, be taken after meals. Dried fruits, in which the natural sugar has become concentrated, are also classified as confections, although they are far less sweet than candy.

SEASONINGS AND FLAVORINGS

There is no cut-and-dried distinction between the terms "seasoning" and "flavoring." As generally applied, salt, pepper, herbs and certain spices are considered seasonings, as are such highly flavored foods as onions, cheese and tomatoes. The word "flavoring" generally is used to describe extracts of vanilla, almond, lemon, etc., fresh fruit juices and chocolate and coffee which are combined with a sweetening. Certain spices also belong in this category.

Salt, for which man has a justifiable craving, has the most important place among seasonings. The search for it started as soon as vegetable foods necessarily began to replace a meat diet which satisfied the needs of the body in this respect. The first trading posts are believed to have originated at points where representatives of tribes met to exchange hides and furs for the precious condiment. Salt was valued not only for its seasoning power but for the part it played in the preservation of meat and fish. It remains today a household staple and is used to season almost every dish. The

right amount of salt adds the necessary savor, although care should be taken not to use it so generously that the natural flavor of foods is injured. Also, tastes differ with regard to the amount of this seasoning, and for this reason it is better to undersalt than to oversalt a dish.

When the diet must be salt-free or salt-low, it is important to make good use of other seasonings. Dishes may be made palatable if the seasonings and the herbs which must be used for flavor are properly blended. For sodium content of spices, see section devoted to low-sodium recipes (Chap. 50). Salt substitutes should be used only when prescribed by the physician, as some of them are harmful. (See Chap. 27.)

Next to salt, pepper is the most common seasoning. In almost every pantry mustard, ginger, cloves, nutmeg and cinnamon will be found, and perhaps celery salt, curry powder, whole cloves, bay leaf, and other leaf or powdered herbs such as sage, thyme and marjoram. Among fresh herbs, parsley and chives are the most commonly used. Onions are always kept on hand, and fresh garlic or salt may be a staple seasoning. Other vegetables such as carrots and mushrooms are often used for their seasoning value. In the broad sense, meat stock and highly flavored fats such as bacon drippings, butter and olive oil may be classified as seasonings. A commercial seasoning, monosodium glutamate, which tends to bring out the natural flavor of foods, is available. It may be used in cooking or as a condiment. Lemon juice, vinegar and bottled sauces such as Worcestershire and catsup are also used to add piquancy to food.

Among flavorings, vanilla extract is in most common use. This may be supplemented by extracts of innumerable flavors, by wine, brandy and rum, by fruit juices and grated orange and lemon rind, and by a variety of spices some of which are also used as seasonings.

Seasonings and flavorings used to suit the taste of the person or the family for whom food is prepared are an important factor in appetite appeal. In the convalescent diet there is a special need for careful seasoning. Sometimes bland foods are preferable, but even these need a certain amount of seasoning and flavoring to make them palatable. Highly flavored foods may cause digestive disturbances, and the condition of the patient as well as his tastes must be considered when meals are prepared for him. An intelligent use should be made of the many accessories which add to the interest of food.

STUDY QUESTIONS

1. What properties have fats, sweetenings, seasonings and flavorings in common? In what respects may they differ?
2. How may fats be classified? Outline the specific purposes for which various types of fats are used.
3. Compare butter and margarine for food value.
4. What products are grouped under sweetenings? Which has become the staple sweetening and for what reason?
5. What seasonings and flavorings are most used? Which has the most important place and why?
6. Discuss the proper use of seasonings and flavorings.

CHAPTER THIRTY-EIGHT

Cereals and Cereal Products

TYPES OF CEREALS
GENERAL COMPOSITION
FOOD VALUE
DIGESTIBILITY
PLACE IN MENU
PREPARATION
BREAKFAST-CEREAL RECIPES
RICE RECIPES
MACARONI AND NOODLE RECIPES

The ancient Romans called the goddess of the grains and the harvests Ceres, and from her name the word "cereal" is derived. Because of their widespread cultivation, the comparative ease of transportation, their keeping qualities and the great variety of products which may be manufactured from them, cereals are now one of the great staples of human diet, as they were in prehistoric days, when food was used where is was grown.

In the United States, in spite of the great variety of foods available, cereals form the basis of practically every meal, as they do in most other countries. Cereal habits have changed greatly since Colonial times. Then grain raised on the farm and ground at a near-by mill furnished the material for the cornmeal mush known as hasty pudding and for the journey-cakes known as johnnycake or hoecake, and for the huge loaves of yeast bread baked in the brick oven usually heated only once a week. Flour was also used for the many pies which during the winter were frozen and used as needed. In some sections of the country, doughnuts were made daily. Later, biscuits were sometimes baked in tin ovens in front of the fireplace, but muffins and fine cakes were not used commonly until a century or so ago, when the kitchen range came into use. Chapter 48 will be devoted to the use of flour in the preparation of baked products in use today. Macaroni and other products of this type made from flour were unknown, but rice was used largely in the South as a vegetable and to some extent in the North for puddings.

The Industrial Revolution brought factory methods of milling flour which produced products of better texture, although at the expense of some minerals and vitamins. Breakfast cereals, even oatmeal, with the exception of the previously mentioned corn-meal mush which was used as often for supper as for breakfast, were not part of the American diet until little more than half a century ago. Oatmeal was used principally at first for the preparation of gruels for the sick and was sold only in drugstores. The modern treatment by cereal manufacturers of grains for breakfast use has

brought such products great popularity. Most breakfast cereals are precooked at the factory, whether they are all ready to eat or whether they demand some cooking in the home kitchen. The fact that these cereals are eaten generally with a generous amount of milk adds to their importance in the diet.

TYPES OF CEREALS

Cereals form the largest crops throughout the world, and cereal foods are present in large proportion in most diets the world over. They are well called the staff of life of every country, whether they are eaten in loaf form or as a boiled or a parched grain. Various racial groups tend to cling to the cereals to which they have been accustomed, as is illustrated by the extensive use of rice by Orientals in countries where wheat is more plentiful. The commonly used cereals have certain distinctive characteristics:

Barley is used after the germ and the bran have been removed. The first form is known as pearled barley. When this is broken up into smaller bits, "instantaneous" barley is obtained, and barley flour is made by grinding the "pearls." Barley water, made from the flour, has been used a good deal in feeding infants and the sick. It contains very little nourishment, but has a soothing influence on the mucous membrane of the digestive tract.

Buckwheat is not botanically a cereal, as it does not belong with the grasses; but it serves the same purpose in the diet. The bran is removed and the rest of the kernel is rolled and bolted.

Corn or maize contains a higher percentage of oil than any other cereal, except oats. Because of its low gluten content, it does not give a flour which can be well used in making leavened doughs. The different kinds of corn are practically the same in composition, although yellow corn has a higher vitamin A content than white corn. Corn meal, cornstarch, samp and hominy are all made from field corn. Corn meal is available in enriched form in some Southern states.

Oat preparations vary little from the original grain. In "oatmeal," therefore, is found a concentrated and valuable cereal which scores higher in protein, fat, minerals and most vitamins than any other cereal. It loses less between the field and the table than is usually the case with the other cereals.

Rye is similar to wheat in most respects, but is not used in the United States so extensively as wheat.

Rice, the staple food of the Orient, is used as an accessory food in this country. In its brown, unrefined form, it supplies certain minerals and vitamins which are largely lacking in white rice, the refined product generally used. These are also present in wild rice, which comes from a different botanical family and which has only limited usage. A new method of processing unmilled rice known as conversion has recently been initiated. Converted rich has much the same cooking qualities and flavor as the milled rice grain. The moist heat to which it is subjected tends to drive some of of the soluble B complex vitamins from the hull into the kernel, so that the B complex in the milled grain is increased. Precooked rice which is

FIG. 82. Cereal is an accepted part of the American breakfast.

now available in packaged form, and which needs only to be brought to a boil, covered and allowed to stand 10 minutes, has become increasingly popular.

Wheat is the cereal which is more generally used than any other in the United States. It lends itself to breadmaking better than any other grain because of its richer gluten content. It is also used in various forms for breakfast cereals. When the whole grain is used, it contributes minerals and vitamins of appreciable value in the diet. The daily use of the whole-grain bread gives an added factor of safety which is of special value where the diet is limited by lack of money or other circumstances.

Recent research in nutrition as related to economic problems indicates that unmilled cereals, if properly supplemented, may assume an even more important place in the low-cost American diet than they do at present. In the interim, white flour enriched with iron, thiamine, riboflavin and niacin is nutritionally advantageous. The improvement in nutritional health of the American people, even under rationing, is attributed to some extent to the flour- and bread-enrichment program. Its

continuance will depend upon the action taken by the individual states, many of which have passed laws to this effect. (See Chap. 2.)

GENERAL COMPOSITION

The cereals are the hard kernels or seedlike fruits of certain plants of the grass family. In proximate composition the whole-grain cereals are similar, although the products made from them may vary decidedly in flavor and in texture:

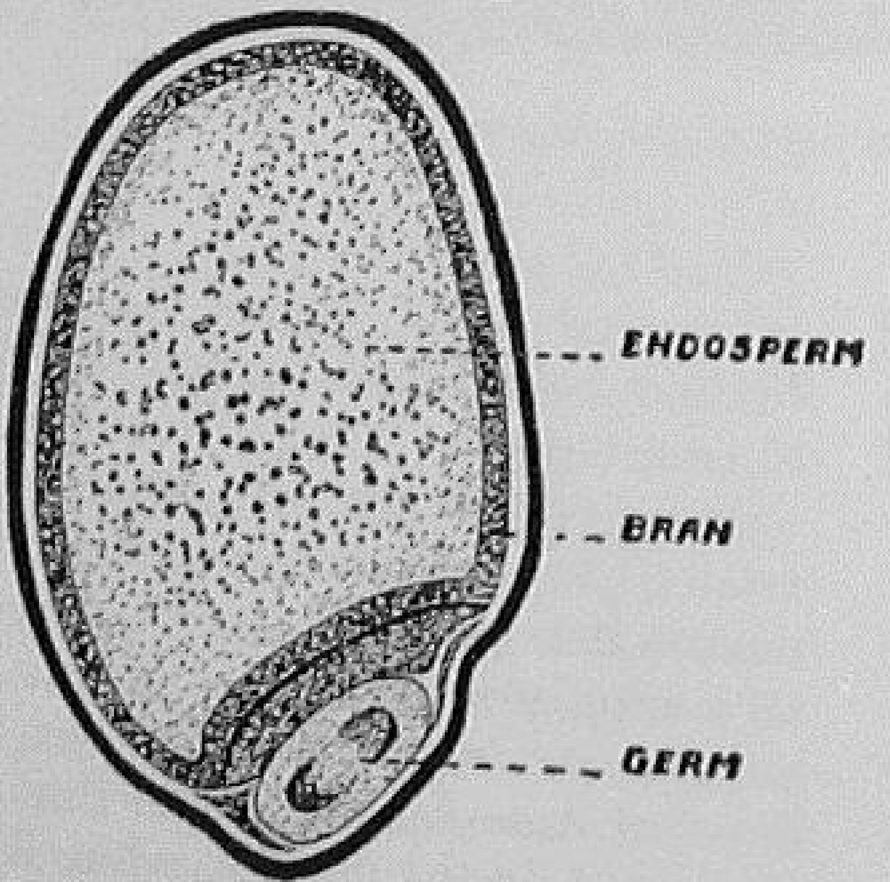
	Per Cent
Water	10 to 12
Proteins	10 to 14
Carbohydrates	65 to 78
Fat	1 to 8
Mineral matter	1 to 2

(Cereals yield from 1,600 to 1,800 calories per pound)

The seed kernel of the grain plant is composed of three parts: germ, endosperm and bran coat. The illustration (Fig. 83) shows the structure of a grain of wheat, and may be taken as typical of all cereals.

The endosperm makes up about 85 per cent of the wheat, as it contains all the materials stored for use by the developing germ. The food is stored mainly in such forms as starch grains and gluten granules. Gluten is a mixture of two proteins, both insoluble in water, and, like starch, available only when the cellulose walls of the cells are broken by grinding or cooking.

The husk or bran is largely cellulose plus a large part of the mineral and vitamin B complex of the grain. The germ is the tiny portion which sprouts when the seed is planted and is the portion which spoils first in



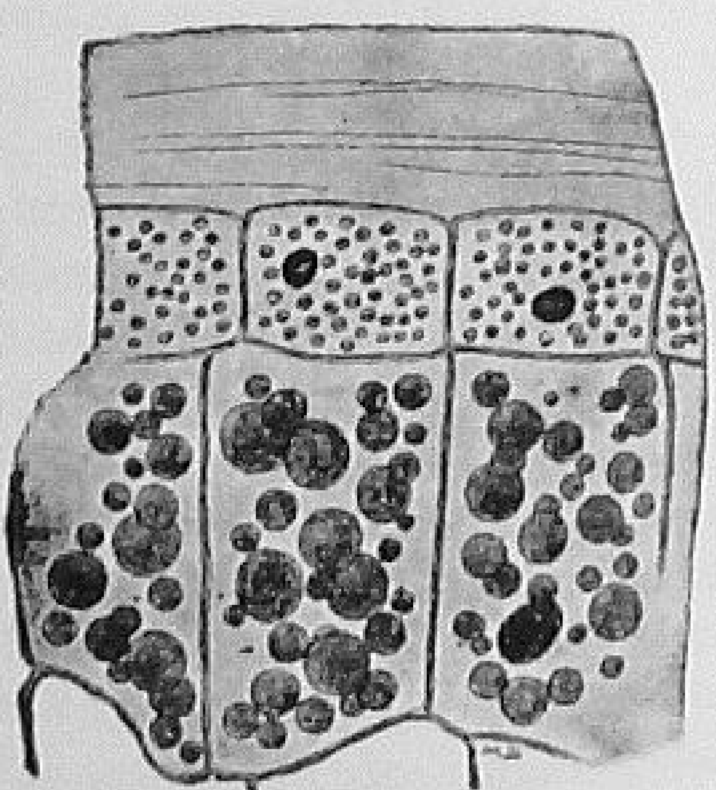


Fig. 83. (*Left*) A grain of wheat has three parts. All are used in whole-wheat flour, but only the endosperm in white flour. Note what a small part of the grain is germ. (Wellman Food Plannings, Lippincott) (*Right*) The outer or bran layer of the wheat grain contains cells richer in protein (aleuron layer) than the central starch-holding or endosperm cells. (Broadhurst: Bacteria in Relation to Man, Lippincott)

whole-grain products. Wheat germ practically free from bran is now on the market and serves as a palatable cereal supplement high in vitamin B complex and vitamin E. The keeping quality of wheat germ or products containing is has now been improved by a method of sterilization. Many cereals are now fortified with wheat germ or some other source of the B vitamins.

FOOD VALUE

The caloric contribution of cereals is considered one of their greatest assets. This would be important even if it was the only nutritive factor provided by them, both because they are used customarily at every meal and because of their low cost. Research has shown, however, that they are more than a supplement to other foods.

The protein content of grains in general ranges from 8 Gm. per 100 Gm. of uncooked rice to 14 Gm. per 100 Gm. of uncooked oatmeal. While it is not of such high quality as the protein from animal sources, it has been found that when it is supplemented by even a small amount of milk, it is a good source. According to L. A. Maynard, of the Cornell School of Nutrition, cereals as the main protein source are quite adequate if some meat and milk are also taken. As this is common practice when grains are made into bread, are eaten as a breakfast cereal and are served at a meal where meat is the main dish, they may be considered an important source of protein. The fact that they are generally among the cheapest foods makes their contribution in this respect doubly important.

The mineral and the vitamin B complex content of the whole grain are higher than those of milled grains, but eating habits and the fact that whole grains and their products spoil more easily than the refined grains make it impractical to urge universal use of whole grains in the general diet. Recognition of these facts prompted the authorities in the national nutrition program to sponsor the restoration of refined grain products to nearly their whole-grain composition. For further discussion of this question see Chapter 2.

Most manufacturers of breakfast cereals voluntarily have brought their products up to whole-grain value through adding minerals and vitamins to the amount removed during the process of manufacture.

The food value of a breakfast cereal is indirectly increased by the fact that a liberal amount of milk is taken with each bowl of cereal. The average person eats most cereals (1 oz.) with ½ cup of whole milk and 1 teaspoon of sugar. This combination of cereal, milk and sugar represents, for the moderately active woman, the following percentages of her recommended total daily food requirements as given in the table at the top of page 460.

DIGESTIBILITY

Cereals are easily digested by the normal person. The fact that they are not made ready for absorption so quickly as sugar, the simplest form of carbohydrate, is usually an advantage. For this reason they aid in keeping the stomach filled to the proper point. Refined cereals are

CONTRIBUTION OF A BOWL OF CEREAL, MILK AND SUGAR TO DAILY FOOD REQUIREMENT

	RECOMMENDED DAILY REQUIREMENTS*	SUPPLIED BY CEREAL, 1 OZ.; WHOLE MILK, 4 OZ.; SUGAR, 1 TSP.	PERCENTAGE TOTAL DAILY REQUIREMENT PER CENT
Calories	2,400.0	215.0	9
Protein	60.0 Gm.	8.0 Gm.	13
Calcium	1.0 Gm.	0.16 Gm.	16
Iron	12.0 mg.	1.69 mg.	14
Thiamine	1.2 mg.	0.20 mg.	17
Riboflavin	1.5 mg.	0.24 mg.	16
Niacin	12.0 mg.	1.0 mg.	8

* Based on allowances of National Research Council for moderately active women.

bland in flavor and in texture, and this may be an advantage in certain conditions. Whole cereals, on the other hand, are advantageous in some cases, as they may stimulate the digestion of other products. However, the roughage in the form of bran which they contain may be a disadvantage.

PLACE IN THE MENU

Breakfast Cereals. Ready-to-eat cereals and those which must have long or short cooking in the home kitchen have a large use at breakfast. Some are also eaten at other meals. They may form a part of the children's supper, and some are used as ingredients of "made" dishes. In dry form, either the ready-to-eat or the precooked porridge-type cereals are used in cookies, muffins and other breads. The rolled ready-to-eat cereals make a good topping or coating for a variety of foods, and may be used as a foundation for quick pastry.

As far as food value is concerned, it makes little difference whether a hot cereal or a ready-to-eat cereal from the same type of grain is used. An ounce of one in dried form, whether it is cooked at home or made ready for consumption at the factory, will equal an ounce of another. The preference of a patient for one cereal or another is the first consideration. In general, unless the patient likes the same product day after day, a variety will add interest to the breakfast tray. Ready-to-eat cereals now come packed in a variety package. It should be noted that the roughage content, which varies greatly, may be a factor in the choice of one or another.

Rice, corn meal or hominy and buckwheat grits are largely used in the South and in every other section by certain national groups as accompaniments to meat and as a foundation for main dishes. Examples are Southern spoon bread, hominy pudding, Italian polenta and gnocchi, the Russian kasha or buckwheat grits

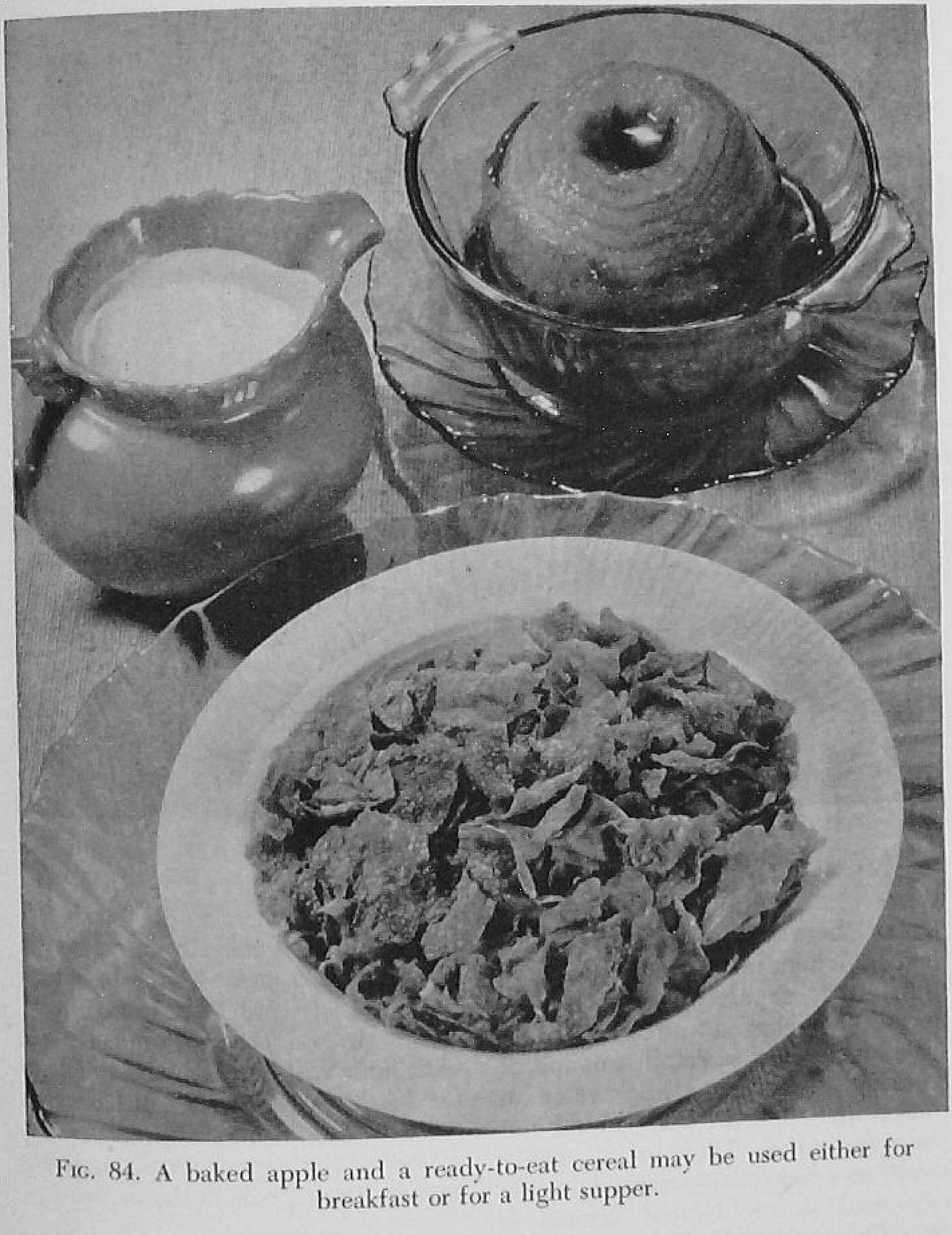


FIG. 84. A baked apple and a ready-to-eat cereal may be used either for breakfast or for a light supper.

and the general use of rice by all Orientals.

Macaroni, spaghetti and noodles are grouped as pastes or "pasta," but they are actually cereal products. A special form of hard wheat is used in their manufacture. From the same paste, macaroni, spaghetti and the even thinner vermicelli are produced. For noodles there is an addition of

FIG. 85. Hot cereal for breakfast.

eggs. These may be made in the home kitchen, but they are generally purchased, as are the rest of the pastes, in packaged form. Paste products need only a small amount of cooking in boiling salted water to make them tender, and should not be overcooked. They are generally used in combination with a highly seasoned sauce. Grated cheese is usually considered a necessary accessory. While these products are sometimes used as an accompaniment to meat, they often form the main dish of a meal in which a small amount of meat may, or may not, be used. Vermicelli is generally used as an addition to a meat soup, to which it gives body and food value.

Breads and other products made with flour will be discussed in Chapter 48 (Bread, Batters and Doughs). As bread in some form is used at every meal by most persons, it has an important place in the menu.

PREPARATION

Ready-to-eat cereals, usually packed in cartons lined or covered with waxed paper, need no home preparation unless the box has been

opened for some time, when, especially in warm weather, they may need to be crisped in the oven before use.

Porridge-type cereals such as oatmeal, ground-wheat products and corn meal need a certain amount of cooking with water. Most cereals of this type are precooked under pressure at the factory and, therefore, need only short cooking in the home. For this reason, they may be prepared over direct heat if this is kept low and the product is stirred occasionally. Many persons prefer a cereal which has not been stirred too much, as this gives it a pasty texture. For cereals such as corn meal, hominy and buckwheat grits, cracked wheat and old-fashioned oatmeal which have not been precooked at the factory, the double boiler is preferable to the open kettle, as its use will prevent scorching during the long process of cooking. No stirring will be necessary. A pressure cooker of small size may be used if directions are followed exactly.

(*Continued at top of Col. 2*)

When breakfast cereals are cooked for serving at a meal, the directions on the package should be followed, unless for some reason it is desirable to have a softer texture than the precooking at the factory provides. When they are to be used for infant feeding, gruels, jellies or waters, longer cooking is desirable. In this case the following chart should be consulted.

Corn meal, although used more often as a foundation for a dish such as fried mush or spoon bread than for a breakfast cereal, is included in the chart. Rice, although used more as an accessory to meals other than breakfast, may be chosen for the first meal of the day, or a fine rice cereal may be used.

BREAKFAST-CEREAL RECIPES

Basic Recipe for Cooking Cereal in Small Quantities

Ingredients and time required for cooking are given in the following table:

Kind	Amount of Cereal	Liquid	Salt	Time, hrs.
Rolled Oats	⅓ cup	1 cup	¼ tsp.	1–2
Wheatena	¼ cup	1 cup	¼ tsp.	½–1
Corn meal	2½ tbsp.	1 cup	¼ tsp.	2–3
Other fine cereals	2½ tbsp.	1 cup	¼ tsp.	½–1

Procedure: Have the water boiling in the top of a small double boiler over direct heat. Add salt, then add the cereal very slowly to the boiling water, stirring constantly. Boil 2 minutes. Place over hot water in the under part of double boiler. Cover and allow to cook the necessary period of time. If too dry, add more boiling water. Dates, raisins or prunes may be added for variation in flavor. For extra food value, 2 tablespoons powdered dry milk may be mixed with the dry cereal. Yield: 2 servings.

Oatmeal Gruel

Ingredients

¼ cup rolled oats
½ teaspoon salt
1½ cups boiling water

Procedure: See general directions for cooking cereals (above). Cook 3 hours. Add more water if necessary. Strain and serve with cream. Yield: 2 servings.

Oatmeal Jelly

Ingredients:

4 tablespoons rolled oats
3 cups boiling wates
½ teaspoon salt

Procedure: Follow directions for oatmeal gruel. Strain into molds, chill and serve with sugar and cream. Yield: 4 servings.

Oatmeal Water

Ingredients:

1½ tablespoons rolled oats
½ teaspoon salt
2 cups boiling water

Procedure: Follow directions for oatmeal gruel.

Rice Jelly

Ingredients:

2 tablespoons rice flour
¼ teaspoon salt
1 cup boiling water
Cinnamon or lemon juice

Procedure: Mix rice flour and salt with enough cold water to make a thin paste, and then add boiling water, stirring constantly. Boil until rice flour is transparent. Add cinnamon or lemon juice as flavoring, if desired. Pour into a mold, and when set unmold. Serve with sugar and cream or milk. Yield: 1 serving.

Barley Flour Gruel

Ingredients:

1 tablespoon barley flour
½ teaspoon salt
1½ tablespoons cold water
1½ cups boiling water

Procedure: Mix flour and salt with cold water. Add boiling water gradually, stirring constantly, and boil until thickened. Salt to taste. Strain through a very fine sieve. Yield: 2 servings.

Barley Jelly

Ingredients:

2 tablespoons barley flour
4 tablespoons cold water
2 cups boiling water
½ teaspoon salt

Procedure: Follow directions for barley flour gruel. Strain into molds, chill and serve with sugar and cream. Yield: 4 servings.

Corn-meal Gruel

Ingredients:

2 tablespoons corn meal
½ cup cold water
½ teaspoon salt
1¼ cups boiling water

Procedure: See general directions for cooking cereals (p. 463).

Flaked-Cereal Gruel

Ingredients:

1 cup boiling water
¼ teaspoon salt
1 cup toasted cornflakes or other toasted flake cereal

Procedure: Combine boiling water and salt, stir in cornflakes. Stir over low heat until cereal is very soft and strain. Yield: 2 servings.

RICE RECIPES

The most common methods for cooking rice are boiling and steaming. For the first method, plenty of rapidly boiling water is necessary. When the rice is tender, it should be drained, rinsed with hot water, drained again and then placed for a few moments over boiling water or in the oven so that it will be fluffy. This is the method generally used

when rice is to be served as a vegetable or used as the basis of a dish. Steaming is used when rice is cooked in milk for use as a dessert, or when it is desirable to obtain a very tender texture. Another method now recommended is to place the rice in twice as much salted water, cover, bring to a boil over high heat, then continue cooking about 15 minutes over very low heat. Precooked rice should be cooked according to directions on the package. If rice is to be served with meat, it may be cooked a few minutes in butter, oil or other shortening before water is added.

Boiled Rice—Method I

Ingredients:

¼ cup rice
3 cups boiling water
½ teaspoon salt

Procedure: Look over rice and wash thoroughly. Add slowly to boiling salted water. Boil actively about 20 minutes until tender. Place in strainer; rinse with hot water. Cover with a towel and place over boiling water to fluff. Yield: 1 serving.

Boiled Rice—Method II

Procedure: Combine rice with twice as much cold salted water. Cover and bring to a boil. Reduce heat to low and simmer about 15 minutes.

Steamed Rice

Ingredients:

¼ cup rice
¼ teaspoon salt
¾ cup hot milk

Procedure: Look over rice, wash and add slowly to salted hot milk in top of a small double boiler. Cook about 1 hour until rice is tender. Yield: 1 serving.

Baked Rice and Cheese

Ingredients:

½ cup cooked rice
½ cup cream sauce (page 547)
¼ cup grated cheese
2 tablespoons soft breadcrumbs
1 teaspoon melted butter
⅛ teaspoon paprika

Procedure: Mix rice lightly with hot cream sauce and grated cheese. Place in small greased baking dish. Mix breadcrumbs lightly with melted butter. Place on top of the rice mixture and sprinkle with paprika. Bake in a moderate oven (350° F.) about 15 minutes until crumbs are lightly browned. Yield: 1 serving.

FIG. 86. Equal amounts of rice, cooked and uncooked, showing difference in volume. (Bureau of Home Economics, U. S. Department of Agriculture)

Baked Rice with Tomato

Ingredients:

½ cup cooked rice
1 teaspoon minced onion
1 teaspoon minced parsley
⅓ cup condensed tomato soup
1 tablespoon grated cheese

Procedure: Mix rice with onion, parsley and tomato soup and place in a greased individual baking dish. Sprinkle with grated cheese and bake in a moderate oven (350° F.) about 10 minutes until cheese is melted. Yield: 1 serving.

MACARONI AND NOODLE RECIPES

Macaroni, spaghetti and noodles, often known as pastas, should be cooked in plenty of boiling salted water until tender but not too soft. They should be drained, rinsed with hot water and drained again before being used as a foundation for a dish. Time of cooking will vary slightly with the brand of product used, and for this reason directions on the package should be followed.

Baked Macaroni with Cheese

Ingredients:

¼ cup broken or elbow macaroni
⅓ cup grated cheese
½ cup cream sauce
Salt
Pepper
1 tablespoon butter

Procedure: Cook macaroni in 2 cups boiling salted water from 8 to 10 minutes (until tender). Drain and arrange in small greased baking dish. Sprinkle with salt, pepper and cheese, and add cream sauce to cover macaroni. Dot with butter and bake in moderate oven (350° F.) until cheese is melted and slightly brown, from about 15 to 20 minutes. Yield: 1 serving.

Baked Macaroni with Tomato

Ingredients:

¼ cup broken or elbow macaroni
1 tablespoon butter
1 teaspoon minced onion
1 teaspoon minced green pepper
1 teaspoon minced celery
½ cup canned tomatoes
¼ teaspoon salt
2 tablespoons soft breadcrumbs
1 teaspoon melted butter

Procedure: Cook macaroni in boiling salted water unitl tender (from about 8 to 10 minutes) and drain. Melt butter, add onion, green pepper and celery and cook 2 minutes over low heat. Add tomatoes, salt and drained macaroni. Blend well, add more salt if necessary, and place in a small greased baking dish. Mix breadcrumbs with 1 teaspoon melted butter and sprinkle over macaroni. Bake in a moderate oven (350° F.) until crumbs are slightly browned, from about 15 to 20 minutes. Yield: 1 serving.

NOTE: 1 tablespoon grated cheese may replace the buttered breadcrumbs.

Spaghetti Preparation

Procedure: Cook spaghetti according to directions on package and dress with well-seasoned tomato sauce. Serve with grated cheese, preferably of the Parmesan type.

Noodles with Browned Crumbs

Procedure: Cook one sixth of the contents of a package of noodles as directed on package and drain. Melt 2 teaspoons butter, add 2 tablespoons fine dry crumbs and stir over low heat until lightly browned. Add another teaspoon butter and combine mixture with hot drained noodles. Yield: 1 serving.

Noodles with Cheese Sauce

Procedure: Cook one sixth of the contents of a package of noodles as directed on package and drain. Prepare half the recipe for rich cheese sauce (see p. 547) and toss noodles into this mixture. Yield: 1 serving.

OTHER SUGGESTIONS FOR NOODLES

Procedure: Drained cooked noodles may be dressed with melted butter or with browned butter. Minced parsley or browned slivered nuts may be added. A few poppy seeds may be stirred in just before serving.

STUDY QUESTIONS

1. Outline the changes in cereal consumption from Colonial times to the present.
2. What grains are most commonly used in the United States today?
3. Compare the nutritive contributions of an average serving of cooked oatmeal with those of an average serving of a ready-to-eat cereal.
4. What type of cereals should be used when roughage must be avoided? Which cereals when roughage is an advantage?
5. Discuss the nutritive contribution made by cereals in general.
6. Which cereal products are known as pastes, and from which grain are they prepared?
7. In what circumstances is it advisable to cook the porridge-type cereals longer than the directions on the package advise?

CHAPTER THIRTY-NINE

Fruits and Nuts

FRUITS
- FOOD VALUE
- DIGESTIBILITY
- PLACE IN THE MENU
- PREPARATION
- RECIPES
- DRIED FRUITS
- CANNED FRUITS

FRUITS (CONT.)
- CANNED FRUIT JUICES
- FROZEN FRUITS

NUTS
- FOOD VALUE
- DIGESTIBILITY
- USE IN THE MENU

Fruits and nuts have been grouped for discussion in this chapter because of their botanical relationship. As they have little in common in regard to food value or use in the menu, their functions as food will be considered separately.

FRUITS

Fruits make a strong appeal to the appetite through the senses of sight, smell and taste. Shape, color, delightful aroma and delicious flavor all contribute to popularizing this group of foods and to making it easy to find a place for them on the menu, to which they contribute nutritionally.

Food Value

The most important contribution of fruit to the diet is its vitamin content. It is particularly high in ascorbic acid, commonly known as vitamin C, which is supplied by fresh fruits in varying amounts. Clinical experience indicates that many adults in the United States do not get enough of this vitamin, more often because of lack of appreciation of its value and food sources than of its cost.

Ascorbic Acid. The best sources of ascorbic acid are fruits of the citrus family and tomatoes. Cantaloupes, strawberries and some other less well-known fruits are good sources. Black currant juice, for instance, was used in Britain with great success to supply ascorbic acid to children during World War II. In the United States, wild blueberries have been found to be fairly well endowed with this vitamin. The buffalo berry, native to North Dakota and near-by states, and papayas and guavas grown in Florida and Hawaii are also high in vitamin C content. Practically all fruits can be counted upon for a certain amount of ascorbic acid. While fruits such as apples, pears and grapes do not contribute largely, they may be a significant source if eaten liberally in raw form. During

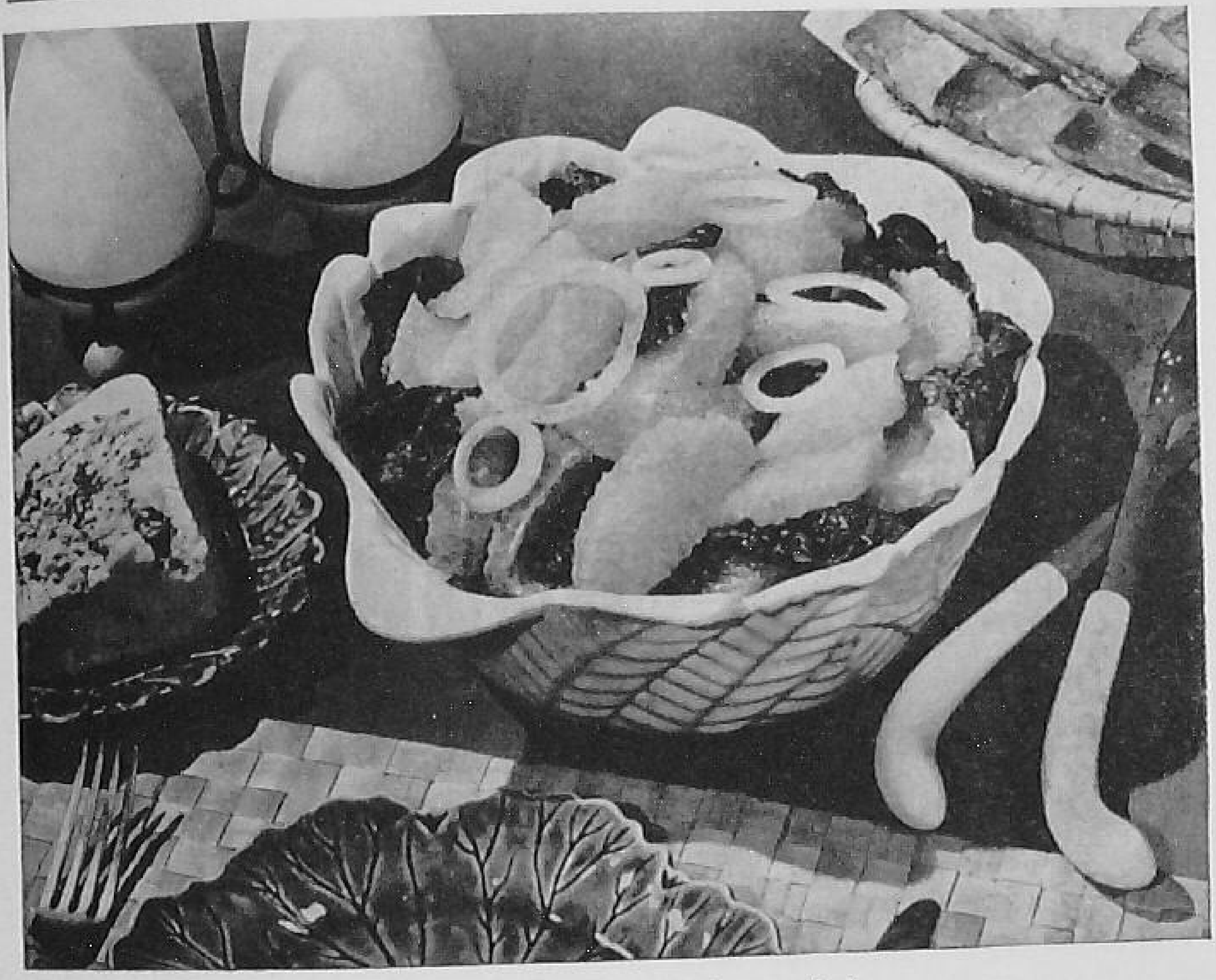


FIG. 87. A refreshing fruit salad.

cooking and canning there is a varying loss. In general, there is a good retention. A comparison of the average amount of ascorbic acid content of canned fruit juices with that of fresh orange juice is shown by Figure 88.

Frozen fruit juice concentrates prepared by a high vacuum process compare well with fresh juice. Orange juice after reconstitution with water may average nearly as high as the fresh juice, depending upon the month in which it was packed.

Frozen fruit concentrates before reconstitution should be stored in the freezing compartment of the refrigerator. There will be no change of flavor and no loss of vitamin content during a period up to two months. After thawing, the concentrate should never be refrozen. After reconstitution, flavor will be retained for at least 24 hours if the container is covered.

A study of the effects of refrigerator storage of fruit juices reported in *Nutrition Reviews*, 1944, sums up the the question as follows:[1]

After one day of refrigeration the average loss of ascorbic acid from freshly opened cans was 3 per cent for grapefruit, 3.7 per cent for orange, 1.1 per cent for pineapple and 24.1 per cent for apple juice. In 3 days of refrigeration the loss from grapefruit

[1] Nutrition Rev. 2:306, 1944.

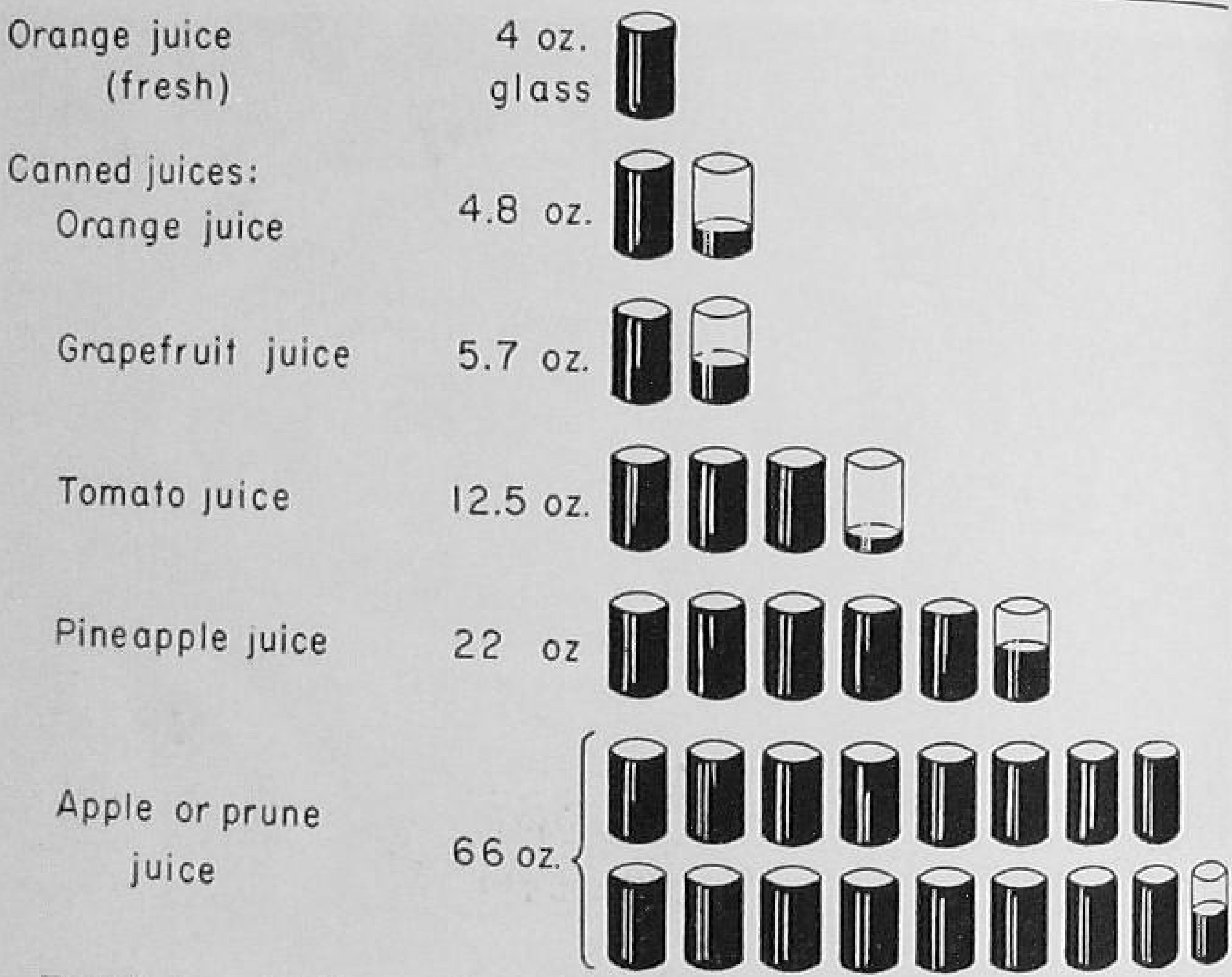


FIG. 88. Amounts of canned fruit juices necessary to supply the same amount of vitamin C as 4 ozs. of fresh or frozen orange juice (⅔ of day's requirement).

juice was only 5.6 per cent. The losses were the same whether the juice was stored in the open can or in a covered glass jar.

Vitamin A. Most fruits supply vitamin A in varying amounts. The best sources are apricots, cantaloupes, yellow peaches and prunes, all of which show in their pulp the color which is usually a sign that vitamin A is present. Dried fruits, if eaten as such, supply an appreciable amount of the B complex.

Mineral Content. Fresh fruits are comparatively low in minerals, but in general they supply an appreciable amount of iron. Dried fruits, because of the removal of water, are more concentrated sources of all factors. When they are soaked and cooked, they of course return to the approximate composition of fresh fruits. For fruits, fresh or dry, the most iron is found in apricots, avocados, bananas, dates, figs, grapes, raisins, prunes, raspberries and strawberries.

Effect upon Acid-Base Balance. One of the important functions of fruit, which is related to its mineral content, is its effect upon the acid-base balance of the body. Fruit is relatively low in the acid elements—phosphorus, sulfur and chlorine—and higher in the basic elements—sodium, potassium and magnesium. In metabolism, an alkaline ash is there-

fore formed which helps to neutralize the acid ash of cereal foods and meat. The citric-acid compounds of lemon, grapefruit and oranges and the malic acid of apples, peaches, berries and other fruits are easily burned in the body and leave an alkaline residue. The acids in prunes, plums, rhubarb and cranberries are not well utilized in the body, and for this reason these fruits must be classed as potentially acid, although they do have an alkaline ash. Because fruits have an acid taste, all are often mistakenly considered as belonging to a class that leaves an acid rather than a potentially alkaline residue. During digestion, fruits retain their natural acids, which are an aid to the passage of food, except when an oversupply of hydrochloric acid is present in the stomach.

Caloric Value. The caloric value of fruits is comparatively low, and chiefly from carbohydrates, usually in the form of sugar. Dried fruits, when eaten as such, are high in calories, but after their water content is restored they return to their original natural value. The caloric value of canned fruits and frozen fruits is increased according to the amount of sugar used in their preparation. The avocado pear and the olive are distinguished from all other fruits by their high fat content, which gives them a comparatively high caloric value.

Digestibility

Fruits are easily digested by normal persons. The sugar content is in the form of glucose and fructose, which are ready for immediate absorption and thus require no digestion in the alimentary tract. With color, odor and flavor all combining to whet the appetite and, therefore, stimulate the flow of the digestive juices, digestion and absorption are naturally rapid. Perhaps it should be mentioned at this point that the prejudices against the use of milk or starchy foods with acid fruits are without foundation.

Fresh fruit should be ripe, but not overripe. Bananas, when the skins are flecked well with brown, may be used even in the diet of children and invalids. For infants they should be mashed or strained. Certain fruits which are not well tolerated in raw form are easily digested when cooked.

A factor which makes fruits of value in the diet is the bulk furnished by the cellulose and the hemicellulose, which stimulate peristalsis. Prunes and figs may even produce a mild laxative effect. The pectin content of some fruits may also be of aid in intestinal disturbances. Seedy berries and apple skins are not always well taken, as they may be irritating to some persons. For details on acid-base foods, cellulose and digestion, see Chapters 2, 6 and 8.

Place in the Menu

The custom of serving fruits twice a day, for breakfast and at some other meal, is good standard nutrition practice. It applies in illness as well as in health if there is no therapeutic reason, which there seldom is, against it. The appetite of a patient may often be tempted more by fruits than by any other type of dessert, and as fruits need little preparation, this will often be a convenience. Use may be made of a large variety of

FIG. 89. Preparation of grapefruit for salad.

fresh, frozen, canned and cooked dried fruits according to their availability in the market.

Generally a citrus fruit is chosen for breakfast. For lunch or dinner, another type of fresh fruit or some cooked or canned fruit may be served unless the patient prefers a citrus fruit more than once a day. In this case, orange juice might be offered for breakfast and grapefruit in the fresh or broiled form for dessert at another meal. Both grapefruit and oranges may be combined with other fruits for a compote. When acid fruits must be omitted from the diet —as, for instance, in cases of hyperchlorhydria or ulcer (see Chaps. 22 and 23)—nonacid fresh fruit, canned and dried fruit should be alternated.

PREPARATION

Fresh Fruits

Large fruits such as apples, pears, peaches, plums, oranges and grapefruit should be washed in order to remove any traces of spray which may be present. If fruit is just ripe enough to eat, it should be put in the refrigerator to prevent softening, but should not be served too cold. Overripe fruits should never be served.

Bananas should be ripened at room temperature until the skins are flecked with brown. If bananas are to be served sliced, they should be prepared at the last moment.

Berries should be kept in the refrigerator until just before serving, when they should be washed thoroughly to remove spray and drained well after washing. Strawberries should be hulled, unless they are to be served whole around a mound of sugar. Grapes and cherries should be washed thoroughly and drained as dry as possible.

Melons should be ripe, but not overripe. They should be chilled and prepared just before serving. Cantaloupes should be halved, other melons cut in slices, and the seeds carefully removed. Sliced lime or lemon may be served with honeydew or casaba melon.

Peaches. Peaches, if ripe, should be kept in the refrigerator. If green, they should be allowed to ripen at room temperature. If they are to be served whole, they should be washed and dried. If they are to be served sliced, they should be peeled and sliced just before they are to be served. Sprinkling with lemon juice will delay change in the color which is caused by exposure to air. They may be sprinkled with sugar at time of slicing, or sugar may be passed with them.

Pears. Pears, if ripe, should be washed and placed in the refrigerator. Otherwise they should be allowed to ripen at room temperature. They are generally served whole and unpeeled. A large juicy pear of the Comice variety may be halved just before serving if desired.

Pineapple. Pineapple should be kept at room temperature. The easiest method of preparation is to cut the fruit in thick slices, pare each slice and then shred with a fork. Sugar is generally necessary, and the flavor will be improved if it is added to the shredded fruit half an hour before serving. It should then be allowed to stand at room temperature, not in the refrigerator. The fruit may be cut in wedges and served around a mound of powdered sugar.

Citrus Fruits. Oranges and grapefruit are used for table service more than any other type of citrus fruit, as they are in season throughout the year. Tangerines are available during some of the winter months, as are kumquats. Lemons and limes have some use as a garnish, when they may either be sliced or cut in wedges. For either purpose, the seeds should be removed. The squeezed juice of either often serves as a flavoring for cold drinks and some desserts and sauces. Citrus fruits are usually stored in the refrigerator, although they will keep some time at room temperature. There is, however, a general preference for chilled citrus fruit.

Oranges are served in juice form more often than any other. Fresh grapefruit juice is sometimes used. Both should be chilled in the refrigerator before they are cut and squeezed. Ice should not be put in the juice as it dilutes it. While the juice can be stored in the refrigerator for a time without changing nutritive value, flavor will change with too long a storage. If it is necessary to strain juice on account of the seeds, a coarse strainer should be used, as a goodly proportion of the vitamin C remains in the pulp.

Frozen juice concentrates should be stored in the freezing compartment of the refrigerator. The contents of a can should be diluted with three times as much water. One third of the standard size 6-ounce can, enough for one serving, may be diluted and the remainder of the still frozen contents returned to the freezing compartment. It should be noted that large cans for hospital service provide a higher concentrate of juice, which should be diluted according to directions. In order to incorporate air, the diluted juice should be stirred or shaken in a covered container.

Large oranges and grapefruit may be served in the shell after they are halved and the segments have been loosened. To prepare, run a sharp knife between the peel and the pulp and loosen the segments from the fiber which separates them, but do not cut the fiber partitions. As citrus fruits have a large amount of natural sweetness, they should be served without sugar, which may be added if desired. Both oranges and grapefruit may be served in sections by themselves or in combination with other fruits as a compote or in salad. They should be pared deeply enough to remove the inner fiber of the skin, after which the sections may be lifted out without destroying the shape. Seeds, if present, should be carefully removed. Navel and Valencia oranges, which are free or almost free from seeds, may be pared and sliced. These oranges and tangerines are sometimes served whole after the rind has been sectioned and turned back around the fruit. To section the rind, run a sharp knife five or six times from stem to blossom end, being careful not to cut pulp, then loosen each section of skin carefully and turn in toward fruit.

Recipes

Raw Fruits

Fresh Fruit Compote

Procedure: A combination of fresh fruits is known as a compote or a cup. The fruits should be put together and sweetened with powdered sugar just before serving. Fruits should then be arranged in a sherbet glass. A tablespoon of sherry, port, brandy or any cordial may be added. The fruit may be garnished with a sprig of mint or it may be topped with a tablespoon of lemon, orange or pineapple ice.

Ambrosia

Procedure: When ready to serve, mix equal parts of orange sections and sliced bananas. Sprinkle with fresh, grated coconut. Sweetened, shredded pineapple or grapefruit sections may also be used in ambrosia.

Avocados

Procedure: Select ripe avocados which are slightly soft to the touch. The skin of a ripe avocado is usually dark green. Prepare fruit just before ready to serve so that flesh will not darken. Cut in half, remove pit. Serve without paring with lemon juice or catsup in the cavity as a first course. Pare and slice for use in salads or dice for fruit cup.

Cooked Fruits

Apple, Baked

Ingredients:

1 cooking apple, medium size
2 tablespoons sugar
Dash cinnamon or nutmeg

Procedure: Wash and core apple carefully from blossom end almost to stem. Pare 1 inch of skin round top. Mix sugar and cinnamon or nutmeg and fill apple with mixture. Place in small bak-

ing dish and add water to the depth of ¼ inch. Cover and bake in moderate oven (375° F.) about 30 minutes (until tender). Apples may be glazed by sprinkling with sugar and placing under the broiler a few minutes until sugar melts. Serve hot or cold. Yield: 1 serving.

NOTE: If practical, bake several apples at the same time.

Applesauce

Procedure: Wash, core and slice 2 tart cooking apples, place in a small saucepan with just enough water to cover. Cover and cook over low heat from 8 to 10 minutes (until soft). Rub through coarse strainer. Sweeten to taste and stir until sugar is dissolved. Add lemon juice or lemon rind, if desired. Serve hot or cold. Yield: 2 servings.

Stewed Apples

Ingredients:

2 cooking apples, medium size
¼ cup sugar
1 cup boiling water
Dash nutmeg or cinnamon

Procedure: Wash apples, cut into eighths. Pare and core. Place in cold water as each section is ready. Combine sugar and boiling water in a shallow saucepan and stir over low heat until sugar is dissolved. Add cinnamon or nutmeg. Drain apples, and cook in sirup until transparent. Add boiling water to sirup if it thickens during cooking. Serve hot or chill before serving. Yield: 2 servings.

NOTE: A few cinnamon drops will give flavor and color.

Banana, Baked

Procedure: Peel banana, place in shallow baking dish and brush with melted butter. Bake in moderate oven (375° F.) from 10 to 15 minutes (until tender) and serve hot as a vegetable. Yield: 1 serving.

If used as dessert: Sprinkle cooked banana with lemon juice and powdered sugar.

Grapefruit, Broiled

Procedure: Wash and dry grapefruit, and cut in halves crosswise. Remove seeds, loosen pulp in sections and remove center cores. Place fruit in baking pan, sprinkle each half with 2 tablespoons brown sugar and dot with 1 teaspoon butter. Broil 6 inches from low broiler heat about 15 minutes.

NOTE: Add 1 tablespoon of wine or rum to each half, if desired.

Pears, Stewed

Ingredients:

2 pears, medium size
6-8 cloves
¼ cup sugar
¼ cup boiling water

Procedure: Wash fruit and pare. Stud each pear with cloves and arrange in shallow saucepan. Sprinkle with sugar. Add water. Cover and cook over very low heat until tender when tried with a toothpick. Serve hot or cold. Yield: 2 servings.

Plums, Stewed

Ingredients:

8 plums
Water
¼ cup sugar

Procedure: Wash plums and prick with fork. Place in small saucepan and add water to half cover. Cover and cook over low heat about 10 minutes (until soft). Add sugar. Stir carefully into sirup and cook uncovered about 2 minutes, until sirup thickens slightly. Yield: 2 servings.

Rhubarb, Stewed

Ingredients:

1 lb. rhubarb
½ cup sugar

Procedure: Trim rhubarb, removing leaves and stem ends of stalks. Wash and cut in 1-inch pieces. Place with sugar in top of double boiler and cook, covered, over hot water, until rhubarb is soft. Yield: 3 servings.

Dried Fruits

Dried fruit should be washed thoroughly. Unless directions on package state otherwise, soak in just enough water to cover for several hours. Cover and cook over low heat in the water in which it was soaked until the fruit is soft. Add sugar to taste, stir until dissolved and keep covered while cooling. Sweet prunes will need no extra sugar. A slice or two of lemon or orange may be cooked with prunes if desired. Stewed dried fruits are usually served cold. Raisins, figs and dates are usually eaten in their own form or are used as an ingredient in a dessert.

Canned Fruits

Canned fruits should be thoroughly chilled before serving. Any fruit may be served in its own syrup or combined with another fruit, fresh or canned. Suggested combinations are: Canned apricots and canned cherries; sliced peaches and pineapple wedges; sliced oranges and cherries.

Canned Fruit Juices

Canned fruit juices have grown in variety and popularity in the last few years. Grapefruit juice and tomato juice are staple products. Pineapple juice, grape juice, apple juice, prune juice and fruit nectars are other canned fruit-juice products which may find a useful place on the invalid's tray. Canned orange juice has improved greatly in flavor under modern conditions of packing. It may be obtained in combination with grapefruit juice. It should be noted that some of the fruit juices are obtainable with or without sugar. The label on the can gives this information. Like fresh fruit juices, the canned fruit juices do not lose vitamin C content quickly if they are refrigerated after the cans are opened, but storage may have an effect on flavor. Fruit juice may be stored in the can without undesirable results.

Frozen Fruits

Frozen fruits should be stored in the freezing compartment unless they are to be used within a few hours. They may be thawed gradually on the shelf of the refrigerator or more quickly at room temperature. They should never be refrozen.

NUTS

The word nut is defined in the dictionary as "a dry fruit or seed having a separable rind or shell and interior kernel or meat." All the products called nuts fall under this definition, excepting peanuts, which, instead of being the fruit of a tree, are tubers, the underground product of a vine. The nuts most commonly used are peanuts, walnuts, pecans, almonds, cashews and Brazil nuts. Coconut, especially in dried, shredded form, is also largely used.

Food Value

The protein content of nuts is generally high, although there is a wide range in this, as will be seen by consulting the Table of Percentage Composition. The protein is of good quality, although not equal in every respect to that furnished by animal products such as meat, milk, fish, cheese and eggs. With the exception of chestnuts, which are low in protein, the fat content is exceedingly high, and the oil obtained from peanuts and coconut has a larger use than these products in their own

form. Most nuts are good sources of the vitamins thiamine, riboflavin and niacin. They contribute the minerals calcium, phosphorus, iron and copper in varying amounts according to the particular nut. Among the nuts in everyday use, almonds and Brazil nuts furnish the most iron.

Digestibility

Because of the high fat content, nuts digest slowly. Chopping or grinding improves digestibility. In the form of butter and combined with other foods, there is usually no digestive difficulty. Peanut butter may be used in sandwiches or as an ingredient of a dish.

Use in the Menu

In general, nuts are considered an accessory to a meal, except in the vegetarian's diet, when it is necessary to draw protein from all vegetable sources. Peanut butter is the only form in which nuts are used as a staple part of a meal. Chopped nuts are often used in cakes and in cookies, and as a flavor or a garnish for various types of puddings and other desserts. They may occasionally be used as a topping for creamed dishes and vegetables or as an accessory to them. As nuts are used so little in the invalid's diet, no specific recipes accompany this chapter.

STUDY QUESTIONS

1. For what reason have fruits and nuts been grouped together for discussion in this chapter? Compare their nutritive contributions.
2. What are the most important contributions of fruits to the diet? List the best sources of ascorbic acid; of vitamin A.
3. List the fruits which supply appreciable amounts of minerals. Discuss the relationship of fruits to the acid-base balance of the body.
4. Discuss the place of fruit in the menu.
5. What are the three most valuable nutritive contributions made by nuts?
6. Compare the digestibility of nuts with that of fruit.
7. Discuss the use of nuts.

Percentage Composition of Some Nuts

	Water per cent	Protein per cent	Fat per cent	Carbohydrate per cent	Calories per 100 Gm.	Calories per Lb.
Almonds, unblanched	5	19	54	20	642	2,888
Brazil nuts, shelled	5	14	66	11	694	3,123
Butternuts	4	24	61	8	677	3,046
Chestnuts, fresh	53	3	2	42	198	891
Chestnuts, dried	8	7	4	79	380	1,710
Coconut, dried, shredded	3	4	39	53	579	2,605
Filberts	6	15	66	14	710	3,195
Hickory nuts	4	14	67	13	711	3,199
Peanuts, roasted	3	27	44	24	600	2,724
Pecans, raw	3	11	70	15	734	3,303
Pine nuts (piñon)	3	13	61	21	685	3,082
Pistachios	7	20	53	19	633	2,848
Walnuts, black	3	18	58	19	670	3,015
Walnuts, English	3	15	64	16	700	3,150

Eggs

FOOD VALUE
AVERAGE COMPOSITION
DIGESTIBILITY
PLACE IN THE MENU
PRINCIPLES OF COOKERY
RECIPES

Egg production has increased largely and consistently in recent years. This has been accomplished through modern scientific production, which has resulted in a greater number of eggs per hen without material increase in size of flocks.

The ideal standard set by the National Research Council for the use of eggs in the diet is "one egg a day if possible." While production, having risen 30 per cent since 1939, has gone beyond this figure, the average household use is still less than the standard recommended by the Council.

Eggs have an especially high place in the diet of the invalid for a number of reasons. They are well liked by almost everyone. Nutritionally they score well. They are easily digested, are quick to prepare, and can also be used as an ingredient in so many dishes, to which they add palatability. This is important when eggs by themselves are not liked.

FOOD VALUE

The food value of eggs can be most fairly estimated by comparing them with meat and milk. They score slightly higher than meat on most counts. The protein, as would be expected from an animal food, is of the same high quality as that of meat and milk.

In iron content, eggs equal meat. They supply vitamin A and riboflavin and a small amount of thiamine. When eggs are cooked, approximately 20 per cent of thiamine and riboflavin is lost. Eggs are a poor source of vitamin C and niacin. Eggs, like milk, will contain vitamin D only if the producing animals have been exposed to sunlight.

Most of the food value of the egg other than protein is concentrated in the yolk, in which most of the minerals and the vitamins are to be found. Both yolk and white contain protein, but the fat content is to be found in the yolk alone. Of the 75 calories furnished by the average egg, 55 are concentrated in the yolk.

AVERAGE COMPOSITION

While eggs differ in size, and for this reason in food value, one average egg does not differ materially from another in composition. There should be no prejudices in favor of either brown or white eggs. In spite

APPROXIMATE COMPOSITION OF HENS' EGGS

	WATER	PROTEIN	FAT	CARBO-HYDRATE	CALORIES per 100 Gm.	CALORIES per Lb.
Whole egg, edible portion...	74	13	12	1	164	745
White only..............	88	11	0	1	48	218
Yolk only..............	49	16	32	1	356	1,616

of the fact that Bostonians will pay 10 cents a dozen more for brown, and that New Yorkers will do the same for white eggs, there is no difference in food value or in flavor. The color of the yolk may vary with the ration of the hens, the theory that highly colored egg yolk necessarily contains more vitamin A is not based on sound scientific evidence.

DIGESTIBILITY

Eggs are easily digested by almost everyone, whether in raw or in cooked form. The fat is in an emulsified state like that of milk, and can be digested in the stomach as well as in the intestines, which is of advantage in certain dietary disturbances.

Raw eggs are not used in the invalid's diet to as large an extent as formerly, when it was believed that they were more easily digested than cooked eggs. Certain experimental work cast doubt upon the complete utilization of raw egg white; but by means of experiments with human beings, Rose and MacLeod show that the coefficient of digestibility may be almost as high for raw white of egg as for cooked. Beaten egg white, however, is more thoroughly absorbed than the white in its natural state. In liquid diets in which egg drinks are used, it is worth while to beat the egg whites.

Unless there is an allergy to eggs, they will seldom cause any digestive disturbance, whether they are served in raw or in cooked form. The yolk of the raw or hard-cooked egg may be added to the infant's food formula at a very early stage, particularly because of its iron and vitamin potency. The white is generally omitted, as the additional protein which it mainly contributes is not needed and children may be allergic to the albumin of the white.

PLACE IN THE MENU

It is not a difficult matter to find a place in the diet for eggs, even when there is a prejudice against them. They can be disguised easily in sauces, desserts and other "made" dishes. Occasionally one finds a natural sensitivity to eggs, and this can be overcome only by careful treatment. In the event that eggs must be eliminated completely from the diet, which, fortunately, is rare, care must be taken to supply other foods high in the same nutrients. In general, however, eggs will be found to be one of the most important constituents of the nourishing and easily digested diet so important in convalescence. Combined with milk or fruit juice, they are used in a liquid and a semiliquid diet, and the first solid food is often an egg in soft-

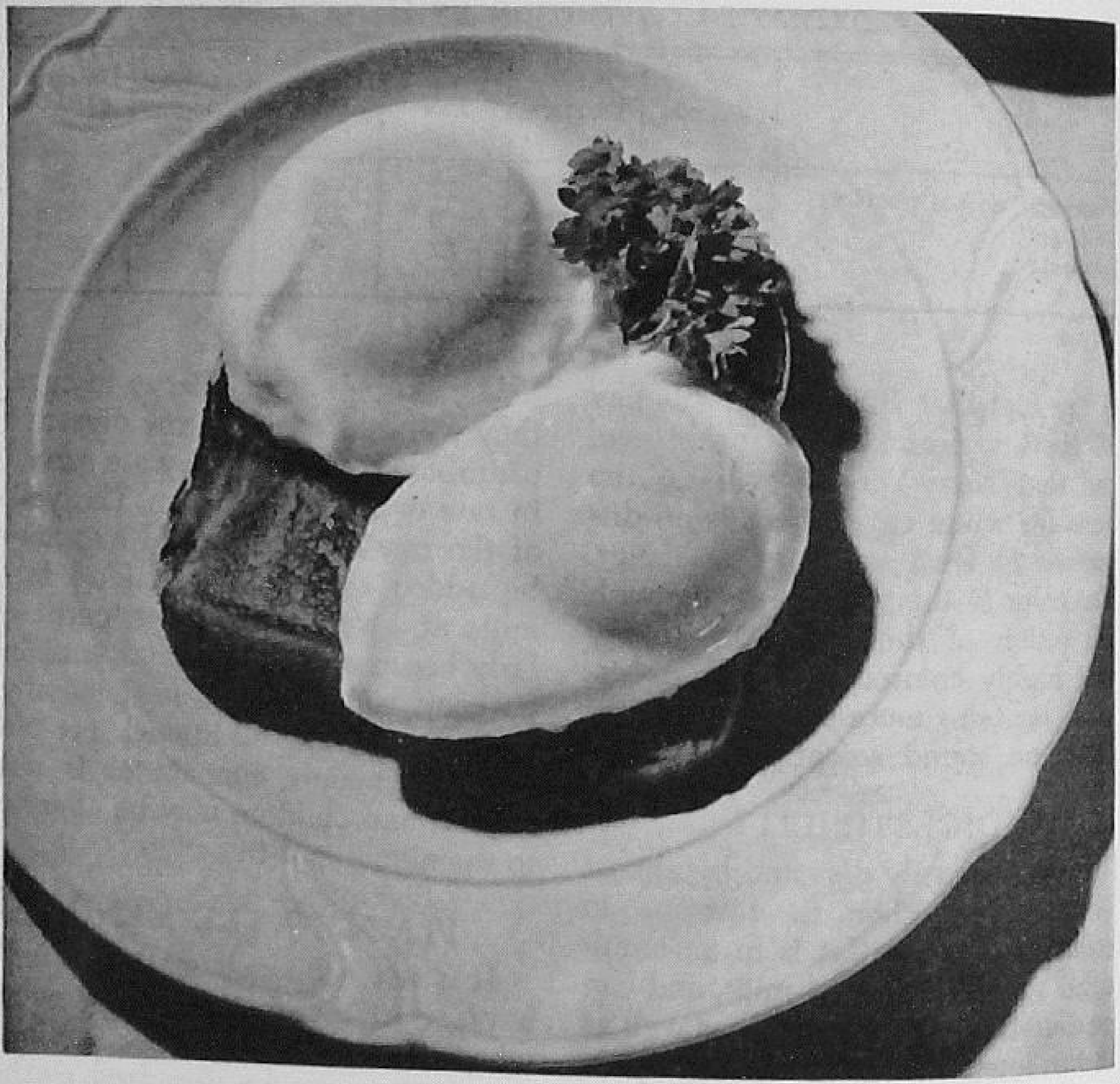


FIG. 90. Poached eggs on toast ready for a meal.

cooked or poached form. Scrambled eggs and omelet follow. Later, combinations of poached or boiled eggs with savory sauces may appear on the invalid's tray for lunch or supper.

Fresh eggs of the best quality should be used when eggs in any form appear on the menu. One taste of an egg which is not perfectly fresh may prejudice the patient against this valuable food. In places which grade eggs before marketing, Grade AA or A quality should be chosen whenever eggs are to be served in their own simple form. Grade B eggs are satisfactory for use as an ingredient for hot breads and cakes. The term fresh to describe an egg of high quality is still used. Actually, eggs gathered soon after being laid, wiped if necessary and cooled and packaged for shipment to a market at some distance may pass the "candling" test better than an egg only a few days from the nest but not subjected to immediate cooling. Good-quality eggs, under proper storage conditions, will

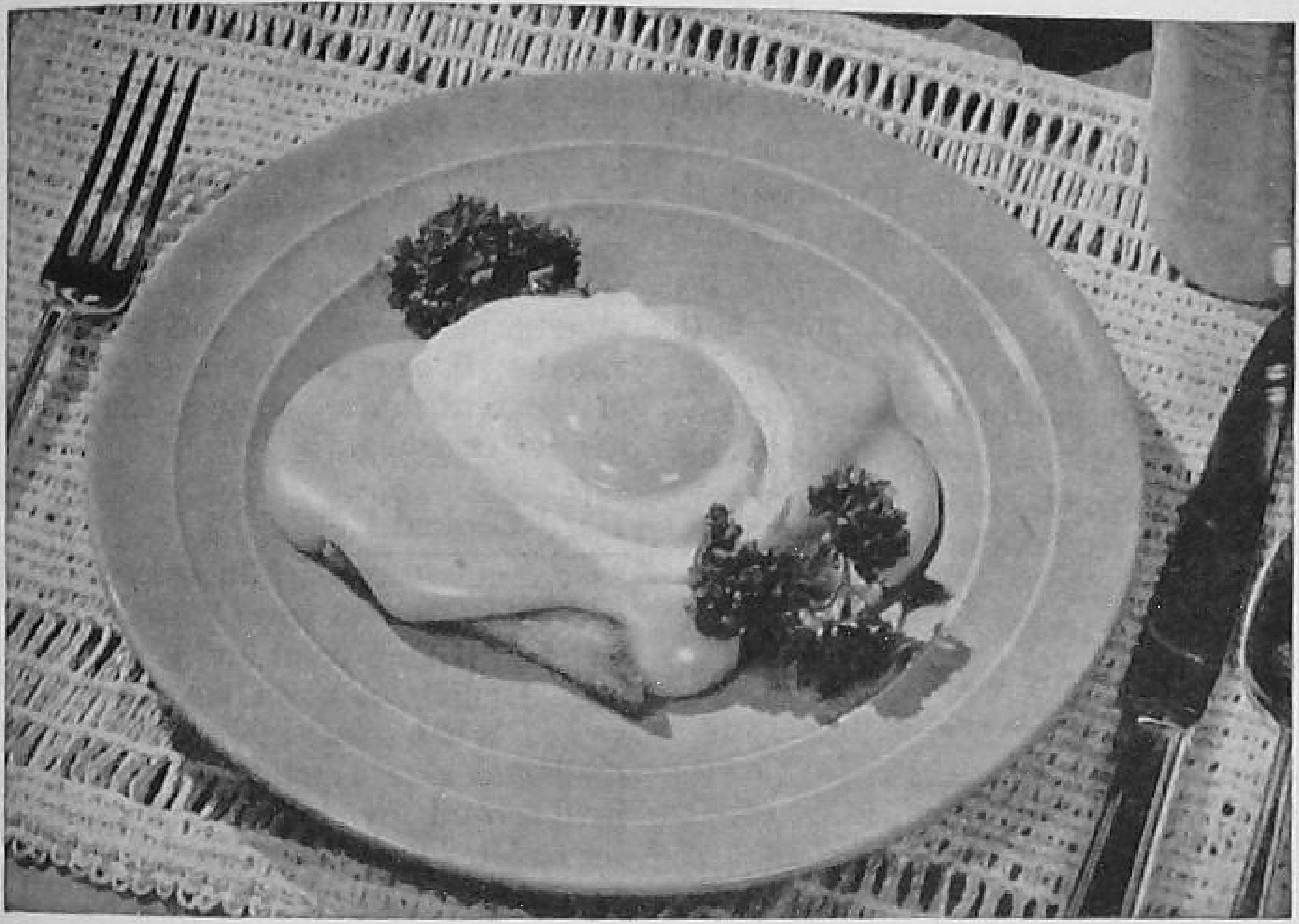


FIG. 91. Poached egg with cheese sauce.

pass the Grade A test after some time in cool storage. Size, by the way, is not a basis for grading.

For commercial use shelled eggs have long been frozen or dried. During World War II enormous quantities of dried eggs were used by the armed forces and by civilians in Britain. Flavor and cooking quality deteriorate during storage, and for this reason there is only small retail distribution. Both frozen and dried eggs are used largely by bakers and confectioners. An attempt to market powdered egg yolks at retail was unsuccessful because of poor keeping quality.

PRINCIPLES OF COOKERY

As soon as eggs come from the market they should be placed in the refrigerator in the carton in which they are packed, unless there is a special compartment for egg storage. Good-quality eggs have clean shells and should not be washed before storage, as washing removes the natural protective coating. Eggs should remain in the refrigerator until just before they are to be cooked, except when they are to form an ingredient of a cake, in which case they will blend better with the batter if they have been allowed to remain at room temperature for some time.

Low temperature and short cooking are desirable for most egg dishes, as the texture will be more delicate and tender under these conditions. For this reason, soft-cooked eggs generally are coddled by being allowed to stand covered in water that

has been brought to the boiling point. Hard-cooked eggs, prepared by boiling, have a firmer texture and are easier to slice or to stuff. For hot service, eggs should be prepared just before they are to be served. Coddled eggs in their shells should be placed on the invalid's tray and opened just before they are to be eaten. It is hardly necessary to say that fried eggs have no place in the diet of the sick or the convalescent. The high temperature of the hot fat will necessarily toughen the albumin, and for this reason, and also because fat is necessarily taken with the egg, digestion will be retarded.

RECIPES

Coddled Eggs

Procedure: Place 2 cups boiling water in small saucepan and bring again to boiling point. Place 1 or 2 eggs in water. If eggs are not entirely covered, add more boiling water. Remove from heat, cover and let stand where water will remain hot from 6 to 10 minutes, according to degree of firmness preferred by the patient. An allowance of about twice as much time as for boiled eggs must be made for coddled eggs. A 3-minute boiled egg will be about the same firmness as one coddled for 6 minutes. If eggs are taken directly out of the refrigerator, allow 1 extra minute for coddling.

Hard-Cooked Eggs

Procedure: Place eggs in saucepan and add cold water to cover entirely. Bring water to boiling point and boil 15 minutes. Drain and cover eggs with cold water. When thoroughly cold remove shell and slice or stuff. Eggs may be hard-cooked by following the recipe for coddled eggs, but allowing the eggs to stand 45 minutes.

Stuffed Eggs

Procedure: Peel hard-cooked eggs and

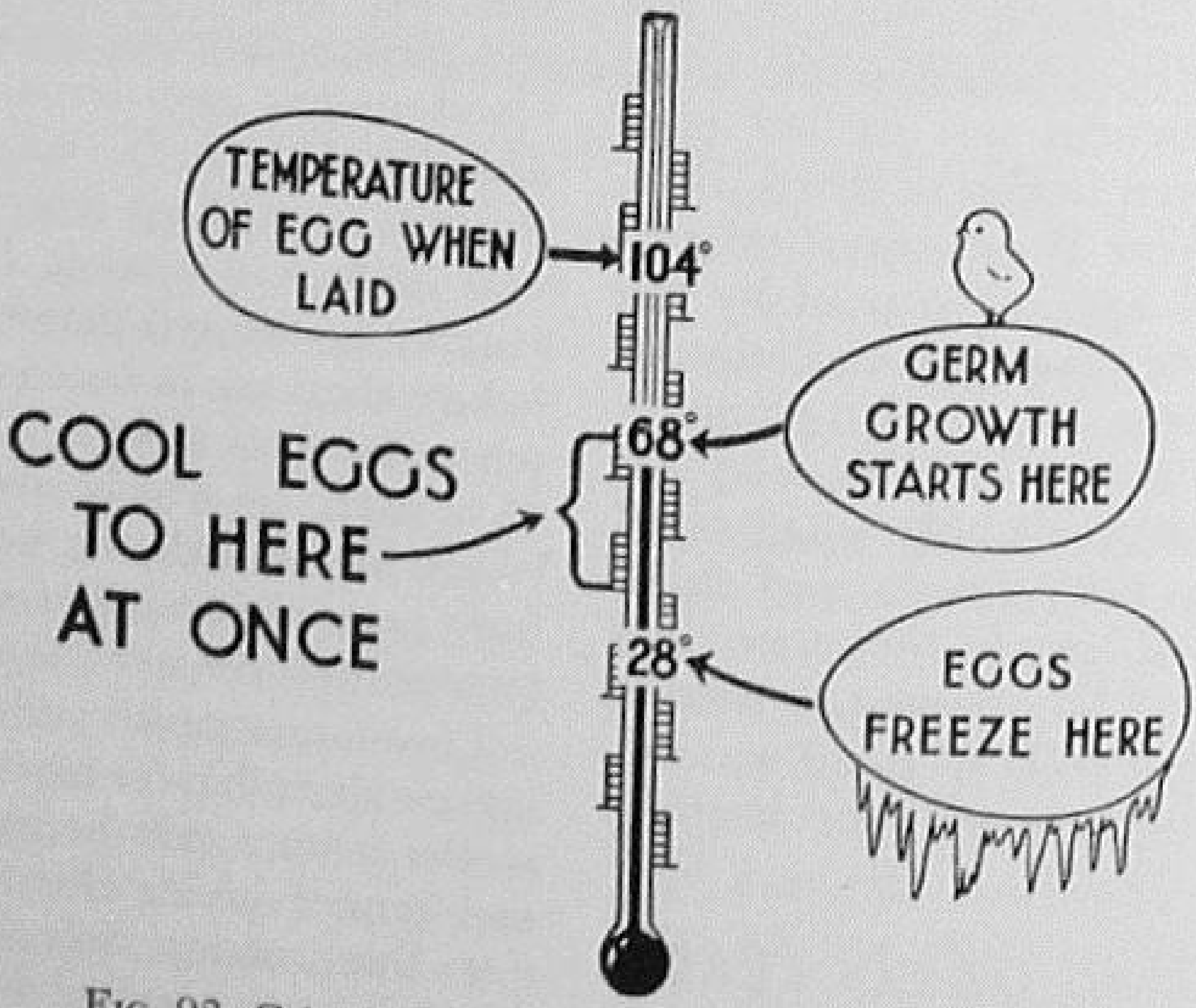


FIG. 92. Critical temperatures of eggs in the shell. (U. S. Department of Agriculture)

cut in lengthwise halves. Remove yolk and press through small, coarse sieve. Add mayonnaise or cream to moisten. Season to taste with salt, pepper and a few drops of onion juice. A teaspoon of minced ham, minced bacon or a very small amount of anchovy paste may be added. Refill whites with mixture and sprinkle with paprika or minced parsley. Allow 1 egg for each serving.

Poached Eggs

Procedure: Place boiling water to the depth of 1 inch in a frying pan. Add dash of salt. Break each egg into saucer; slip egg into boiling water. Remove from heat, cover, let stand about 5 minutes (until eggs are firm). Remove from water with pancake turner, allowing water to drain from eggs, and serve on hot buttered toast.

Eggs Poached in Milk

Procedure: Follow preceding directions for poached eggs, substituting hot milk for water. Serve eggs on toast and pour hot milk over them.

Eggs Poached in Butter

Procedure: Place 1 teaspoon butter in a small frying pan and melt over low heat. Break each egg into saucer and slip into frying pan. Remove from heat, cover, let stand about 5 minutes (until eggs are firm). If a harder egg is desired, let stand over low heat 1 more minute.

Poached Egg with Cheese Sauce

Ingredients:

⅛ lb. grated cheese (½ cup)
⅛ cup evaporated milk
1 slice toast
1 egg, poached
Salt and pepper to taste

Procedure: Melt the cheese over hot water. Add the milk gradually, stirring constantly. Add seasonings. Pour hot cheese sauce on toast, top with the poached egg.

Plain Omelet

Ingredients:

2 eggs
¼ teaspoon salt
Dash pepper
2 tablespoons milk or water
1 tablespoon butter

Procedure: Beat eggs until very foamy. Add seasonings and liquid. Melt butter in small frying pan and add egg mixture. Place over medium heat and lift edges of omelet as it cooks. Tip frying pan to allow liquid to run under the firm portion. Shake over heat until slightly brown and fold with spatula from handle of frying pan to outer edge. Slip onto a hot plate and garnish with parsley. Yield: 1 serving.

Foamy Omelet

Ingredients:

2 egg yolks
2 tablespoons water
¼ teaspoon salt
Dash pepper
2 egg whites
1 tablespoon butter

Procedure: Beat egg yolks with water and seasonings until very foamy. Beat egg whites until stiff and fold into first mixture. Melt butter in small frying pan, add omelet mixture and shake over low heat until omelet is slightly brown on the bottom. Test by lifting with spatula. Place frying pan in moderate oven (350° F.) about 5 minutes (until omelet is dry on top). Remove from oven and make a shallow cut through center at right angles to handle, fold and slip on to hot plate. Yield: 1 serving.

Scrambled Eggs

Ingredients:

2 eggs
2 tablespoons milk or cream
¼ teaspoon salt
Dash pepper
1 tablespoon butter

Procedure: Beat eggs just enough to mix yolks and whites, stir in milk or cream and seasonings. Melt butter in small frying pan or in top of double boiler. Stir over low heat or hot water as eggs become firm. Stir only enough to prevent eggs sticking to pan. Serve at once. Yield: 1 serving.

Shirred Eggs

Procedure: Butter an individual baking dish and line with soft buttered and seasoned bread crumbs. Break 1 or 2 eggs carefully into dish and sprinkle with salt and pepper. Add 1 tablespoon cream, cover with buttered soft bread crumbs and bake in moderate oven (375° F.) about 15 minutes (until eggs are firm). Yield: 1 serving.

Baked Eggs with Cheese

Procedure: Break 1 or 2 eggs into a small shallow, greased baking dish. Sprinkle with salt and pepper and cover with grated cheese. Add top milk just to cover eggs and bake in moderate oven (375° F.) about 15 minutes (until eggs are firm). Yield: 1 serving.

Baked Eggs Espagnole

Procedure: Break 1 or 2 eggs into a small, shallow, greased baking dish. Sprinkle with minced onion and minced green pepper. Add condensed tomato soup just to cover eggs and bake in a moderate oven (375° F.) about 15 minutes (until eggs are firm). Yield: 1 serving.

Baked Eggs, Savory

Procedure: Break 1 or 2 eggs into a small, shallow, greased baking dish. Sprinkle with minced ham. Cover with buttered soft crumbs and bake in a moderate oven (375° F.) about 15 minutes (until eggs are firm). Yield: 1 serving.

Baked Eggs with Spinach

Procedure: Line a small, shallow, greased baking dish with well-seasoned chopped cooked spinach. Break 1 or 2 eggs on the spinach. Sprinkle with salt and pepper, and minced onion if desired. Add top milk just to cover eggs and bake in moderate oven (375° F.) about 15 minutes (until eggs are firm). Yield: 1 serving.

Creamed Eggs

Ingredients:
- 1 tablespoon butter
- 1½ teaspoons flour
- ¼ teaspoon salt
- Dash pepper
- ½ cup milk
- 1 hard-cooked egg

Procedure: Melt butter in small saucepan, add flour and seasonings, stir until smooth. Stir in milk slowly and cook over low heat, stirring constantly until sauce thickens and boils. Shell and slice hard-cooked egg, add to hot sauce, reheat and pour over slice of buttered toast. Garnish with minced parsley. Yield: 1 serving.

NOTE: A dash of Worcestershire sauce or 1 teaspoon of catsup may be added to the cream sauce after it has thickened.

STUDY QUESTIONS

1. Compare the food value of eggs with that of milk and meat.
2. Discuss the digestibility of eggs.
3. Outline the principles of egg cookery.
4. List a few simple recipes for cooking eggs suitable for use in the early stages of convalescence.
5. Suggest several methods of treatment by which eggs may be made more interesting on the menu.

CHAPTER FORTY-ONE

Desserts

FUNCTIONS OF DESSERTS
GENERAL RULES FOR SERVING
RECIPES
FRUIT DESSERTS
CUSTARDS AND PUDDINGS
RECIPES (CONT.)
GELATIN DESSERTS
FROZEN DESSERTS
SAUCES

"The mission of dessert is being that of a comforter of the stomach, which being already appeased, nevertheless requires a little reflex flattery," says Elwanger in his *Pleasures of the Table*. This mission is perhaps more important in the menu of the convalescent than in any other.

FUNCTIONS OF DESSERTS

Desserts have several functions, however, in the invalid's diet. Perhaps the first is the satisfaction that most people feel in having an attractive sweet at the end of a meal. At the same time, it is often possible to supply nutrients particularly needed by a patient in a form to tempt appetite. When it is necessary to increase caloric content of a diet, desserts may be counted upon to furnish this in the concentrated and yet digestible form. When extra protein is indicated, desserts containing milk and eggs are valuable. The protein content may be increased to a larger extent by using milk in a concentrated form, by doubling the number of eggs in a recipe and by using special protein concentrates. When calories must be kept low or when there is any reason for increasing the vitamin C content, fresh fruits, especially of the citrus type, are generally the best choice for dessert. Dessert recipes adapted for special therapeutic diets will be found in Chapter 50. For the preparation of fresh fruits see Chapter 39.

Desserts fall into several general categories, which, however, overlap in many cases. For instance, simple combinations of milk and eggs are known as custards. When the same ingredients are thickened with gelatin, they fall into the classification of gelatin desserts. When thickened with a cereal such as cornstarch or flour, or when combined with bread, they are usually known as puddings.

Frozen desserts are generally acceptable and are valuable because they are both refreshing and nourishing. As good-quality ice cream and ices are commonly available in manufactured form, they will seldom be prepared in the home. Recipes for a few frozen desserts which can be frozen satisfactorily in the automatic refrigerator are included in this chapter.

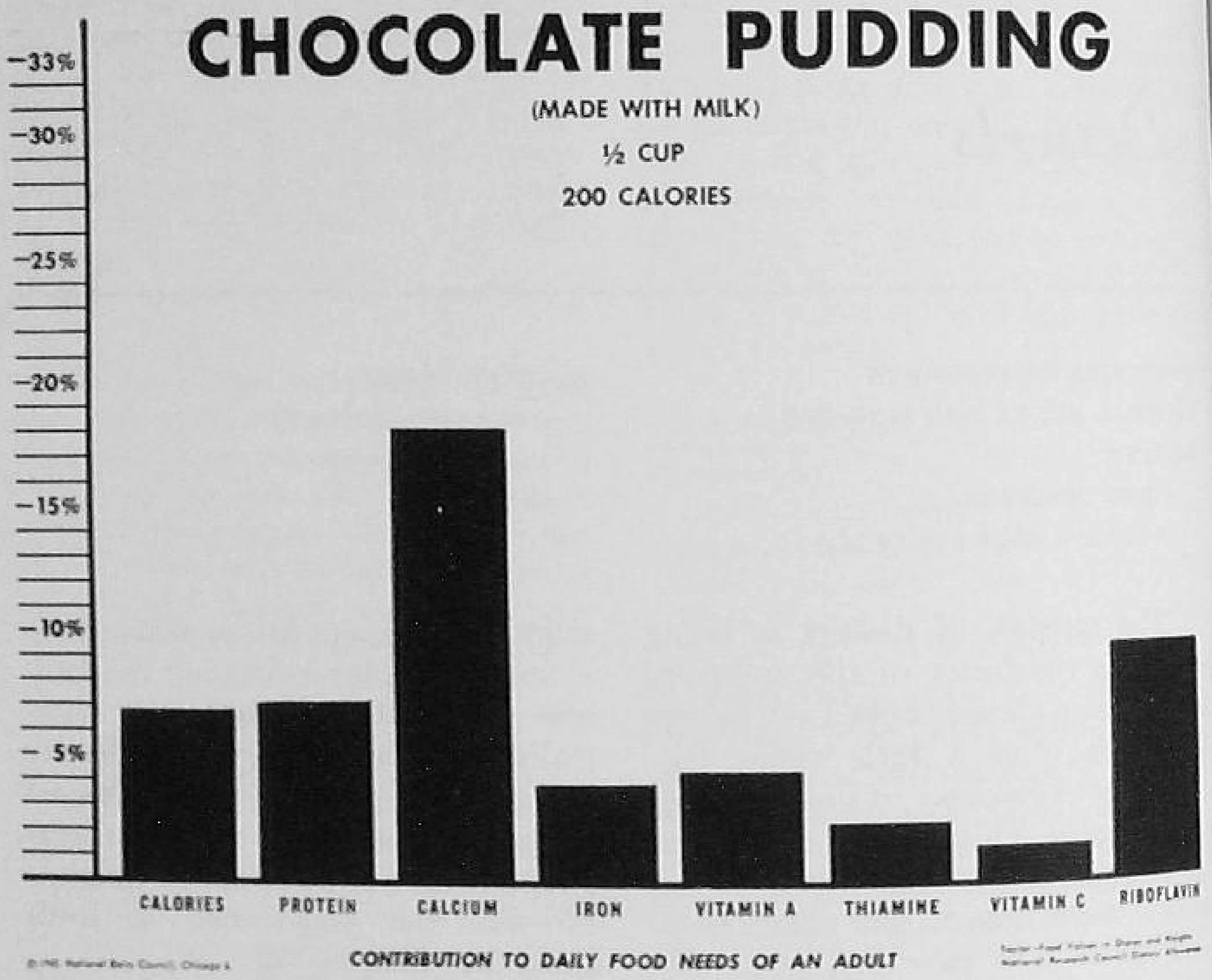


FIGURE 93

GENERAL RULES FOR SERVING DESSERTS

As a rule, desserts for the invalid must be light and easy to digest. Fruits, custards, gelatin desserts and ice cream may all appear on the invalid's tray, but there is seldom any reason for serving rich puddings and pies.

Small portions are usually more acceptable than large ones, as, when appetite is poor, the very sight of a large portion may be unappetizing.

Serving dishes for desserts should be chosen carefully. Plates for cold desserts should be chilled and for hot ones should be warmed.

Garnishes for desserts should be simple and of contrasting color.

RECIPES

FRUIT DESSERTS

Classified under fruit desserts are whips, soufflés and creams, which are combinations of strained fruit pulp with eggs or whipped cream, and baked fruit puddings for which sliced fruit is combined with bread. The desserts in the first group are light; in the second, heavier.

Fruit Whips. A fruit whip is a combination of beaten egg white and sweetened fruit pulp. Stewed prunes or apricots, applesauce or fresh strawberries, raspberries or peaches may be used. The amount of fruit necessary for a whip will vary with the amount of juice combined with

the pulp. The final product should be stiff enough to hold its shape and should be served in a sherbet glass. A custard sauce or whipped cream may be served with a whip.

Basic Recipe for Fruit Whip I

Ingredients:
- 1 egg white
- Dash salt
- 2 tablespoons sugar
- ¼ cup strained cooked fruit pulp or ½ cup strawberries or raspberries, crushed and sugared
- 1 teaspoon lemon juice

Procedure: Beat egg white with salt until stiff, add sugar, fold in fruit pulp and lemon juice. Add more sugar, if necessary, and pile in sherbet glasses. Yield: 2 servings.

Basic Recipe for Fruit Whip II

Ingredients:
- 1 egg white
- Dash salt
- ½ cup sugar
- ¾ cup crushed fruit, fresh, canned or frozen
- 1 teaspoon lemon juice

Procedure: Combine ingredients in smaller bowl of electric mixer. Blend at low speed and continue beating 5 minutes until mixture will hold its shape. Yield: 4-5 servings.

Lemon Cream

Ingredients:
- 1 egg
- ¼ cup sugar
- Dash salt
- 1 tablespoon lemon juice
- ¼ teaspoon grated lemon rind
- 1 tablespoon boiling water

Procedure: Place egg yolk, sugar, salt, lemon juice and rind in top of small double boiler. Stir until well bended, add boiling water and stir until sugar is dissolved. Stir over hot water until smooth and thick. Remove from heat, fold in stiffly beaten egg white. Pour into bowl and chill in refrigerator. Just before serving stir and pile in sherbet glass. Yield: 1 liberal serving.

Pineapple Cream

Ingredients:
- ½ cup boiled rice (p. 465)
- 2 tablespoons crushed pineapple
- ¼ cup cream

Procedure: Combine rice with crushed pineapple. Whip cream and fold into rice mixture. Serve in sherbet glass. Yield: 1 liberal serving or 2 small servings.

Baked Rhubarb Pudding

Procedure: Line bottom and sides of small greased baking dish with buttered bread. Fill with alternate layers of diced rhubarb and sugar, cover with slice of bread. Dot with butter. Bake in moderate oven (375° F.) about 25 minutes. Yield: 2 servings.

Note: Sliced apples may replace the rhubarb.

Brown Betty

Ingredients:
- 2 slices bread
- 1 tablespoon butter
- 1 cup thinly sliced apples
- ¼ cup sugar
- ½ teaspoon cinnamon

Procedure: Trim crusts, dice bread and sauté in butter until browned. Arrange in alternate layers with apples, sugar and cinnamon in small greased baking dish. Cover and bake in moderate oven (375° F.) 20 minutes. Remove cover and bake until brown. Serve hot with cream. Yield: 2 servings.

Custards and Puddings

Custards, which are combinations of eggs and milk, sweetened and flavored, are natural carriers of protein. To increase this content further, see High-Protein Recipes on page

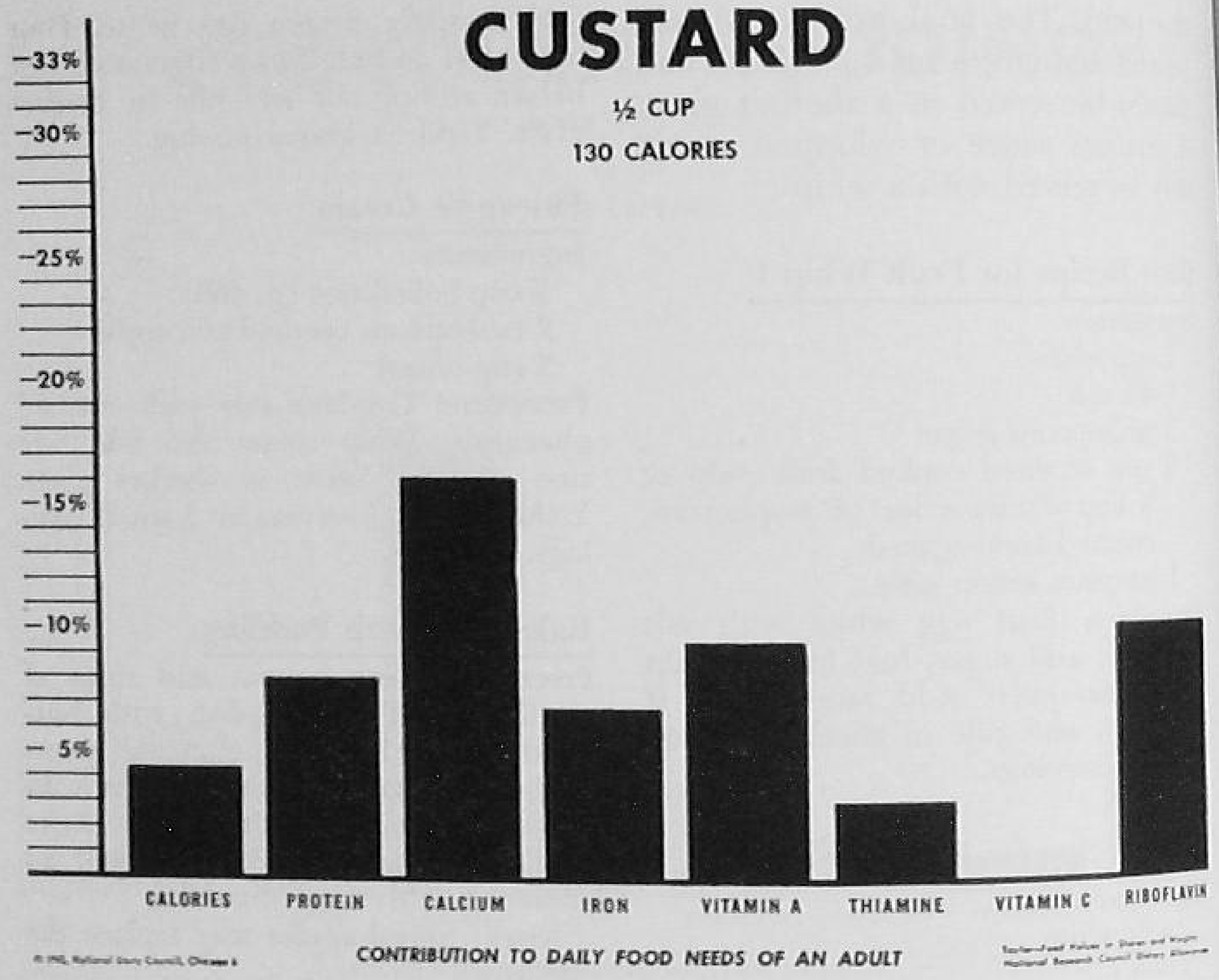


FIGURE 94

608. For texture and flavor they must be baked in hot water or cooked over hot water in a double boiler. Directions must be followed exactly as to length of time to cook, as overcooking will cause some of the ingredients in baked custards to separate or whey.

Desserts usually known as puddings, of which tapioca cream, rice pudding, blanc mange and bread pudding are examples, depend upon a cereal product for extra thickening, although they all contain milk and eggs, the basic ingredients of a custard. Junket, in which milk is thickened by use of a rennet tablet, is sometimes known as a custard, although no eggs are used in its preparation.

Baked Custard

Ingredients:
- 1 cup milk
- 1 egg
- 1 tablespoon sugar
- ⅛ teaspoon salt
- Nutmeg

Procedure: Scald milk. Beat egg slightly, stir in sugar, salt and milk, continue stirring until sugar is dissolved. Strain and pour into custard cups. Sprinkle with nutmeg and bake in a pan of hot water in moderate oven (375° F.) about 30 minutes. To test: Insert knife into custard. When no custard adheres to knife, take from oven at once and place cups in cold water. Yield: 2 servings.

NOTE: 2 eggs instead of 1 may be used, if desired. Cooking time will be slightly shorter in this case. Vanilla may be added for flavoring, if desired.

Caramel Custard

Procedure: Follow directions for baked custard. Before placing custard in cups, butter them liberally and put 1 tablespoon caramel syrup (see below) in the bottom of each cup.

Caramel Sirup

Procedure: Place ¼ cup sugar in small frying pan, stir constantly over low heat until sugar melts and forms a sirup. Add another ¼ cup sugar and continue stirring until dissolved. Add ¼ cup boiling water very carefully and stir over low heat until sirup is smooth. Yield: Approximately ½ cup.

Bread Pudding

Procedure: Follow preceding directions for baked custard. Remove crust from 1 slice buttered bread, cut slice in half and put in the bottom of a small baking dish. Pour custard mixture over bread. Bake according to directions for baked custard. Serve hot or cold. Yield: 2 servings.

Cream Custard

Ingredients:

1 egg white
1 tablespoon sugar
Dash salt
½ cup thin cream
Nutmeg

Procedure: Mix egg white, sugar and salt; add cream and stir until sugar is dissolved and egg white thoroughly mixed with cream. Pour into custard cups, sprinkle with nutmeg and bake according to directions for baked custard. Yield: 2 small servings.

Soft Custard

Ingredients:

1 cup milk
2 egg yolks
2 tablespoons sugar
Dash of salt
¼ teaspoon vanilla

Procedure: Scald milk. Place egg yolks, sugar and salt in top of a small double boiler and stir until blended. Stir in scalded milk slowly and cook over hot water, stirring constantly until the custard when tested coats a metal spoon. Remove at once from hot water and place in cold water to cool quickly. Add vanilla and chill. Serve as dessert with whipped cream, or pour over sliced oranges, berries, stewed pears, boiled rice or sponge cake. Yield: Approximately 1¼ cups custard.

Custard Rice Pudding

Procedure: Follow directions for soft custard, increasing amount of sugar to ¼ cup. Have ready ¾ cup boiled or steamed rice and fold into hot custard mixture. Pile into sherbet glasses and sprinkle with grated nutmeg or grated orange rind and chill. Yield: 2 servings.

NOTE: ¼ cup seedless raisins or drained crushed pineapple may be folded into the rice before being added to the custard.

Fluffy Custard

Ingredients:

1 cup milk
¼ cup sugar
1 tablespoon flour
Dash of salt
2 egg yolks, slightly beaten
2 tablespoons brandy, rum or sherry
2 egg whites, stiffly beaten

Procedure: Scald ¾ cup milk in top of double boiler. Mix sugar, flour and salt, stir into beaten egg yolks. Stir in cold milk to make a smooth paste and stir into scalded milk. Continue stirring over hot water until mixture thickens slightly. Remove from heat and cool slightly. Add flavoring and fold into beaten egg whites. Chill and serve with berries or sliced fruit. Yield: Approximately 1½ cups custard.

Tapioca Cream

Ingredients:
- 1 tablespoon quick-cooking tapioca
- Dash salt
- 1½ tablespoons sugar
- 1 egg
- 1 cup milk
- ¼ teaspoon vanilla

Procedure: Mix tapioca, salt, sugar and egg yolk in top of small double boiler. Stir in milk gradually and cook over hot water, stirring frequently from 8 to 10 minutes until tapioca is transparent and mixture thickens slightly. Remove from heat. Add vanilla and fold into stiffly beaten egg white. Pour into bowl or sherbet glasses and chill. Yield: 3 servings.

Golden Tapioca

Procedure: Follow preceding directions for tapioca cream, substituting 2 tablespoons brown sugar for 1½ tablespoons sugar.

Blanc Mange

Ingredients:
- 1 cup milk
- 1½ tablespoons cornstarch
- 1 egg yolk, slightly beaten
- 2½ tablespoons sugar
- Dash of salt
- ½ teaspoon vanilla extract
- 1 egg white, stiffly beaten

Procedure: Scald ¾ cup milk in top of double boiler. Stir remaining milk into cornstarch to make a smooth paste. Stir into the scalded milk and continue stirring until slightly thickened. Cover and cook over hot water 10 minutes. Combine slightly beaten egg yolk, sugar and salt; stir in the hot mixture slowly. Add vanilla and beat well. Then fold into the stiffly beaten egg white. Pour into molds and chill until firm. Unmold and serve with plain or whipped cream, custard sauce (see Soft Custard, p. 489; Chocolate Sauce, p. 496) or crushed sweetened fruit. Yield: 3 servings.

Chocolate Blanc Mange

Procedure: Follow preceding directions for blanc mange. Add ½ square shaved chocolate to milk before scalding. As chocolate melts, beat with rotary egg beater until completely blended with milk.

Coconut Blanc Mange

Procedure: Follow directions for blanc mange. Fold 2 tablespoons shredded coconut into hot mixture before adding beaten egg white.

Macaroon Blanc Mange

Procedure: Follow directions for blanc mange. Fold 3-4 broken macaroons into mixture before adding beaten egg white.

Junket

Ingredients:
- ½ junket tablet
- ½ tablespoon cold water
- 1 cup milk
- 1 tablespoon sugar
- ¼ teaspoon vanilla

Procedure: Crush junket tablet and dissolve in cold water. Heat milk until lukewarm. Add sugar and vanilla, stir until dissolved. Stir in dissolved junket and pour at once into individual serving dishes. Let stand in a warm place until set. Chill and serve with a bright red jelly or whipped cream. Junket custards are now available in package form. Yield: 2 servings.

Prepared Puddings

Many prepared mixes for puddings and frozen desserts are now available for purchase. These come in a variety of flavors and call for the addition of milk or water and short cooking or a period of freezing time in the automatic refrigerator. Many of them compare favorably with desserts prepared by a home recipe. Often they will be found con-

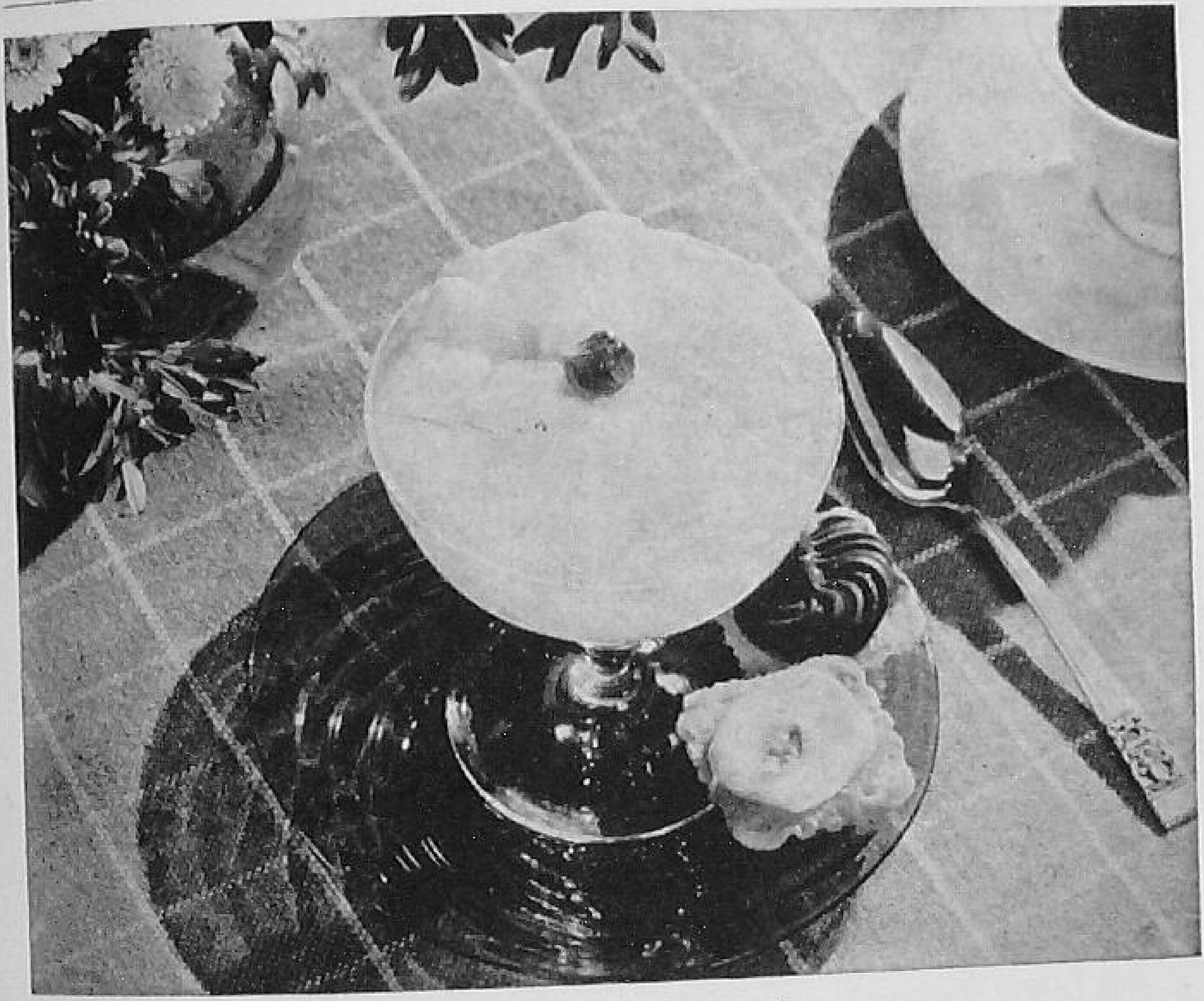


FIG. 95. Fruit snow pudding ready to serve.

venient by the nurse who has many other duties besides preparing and serving meals for her patients.

Gelatin Desserts

Gelatin desserts serve several purposes in the invalid's diet. Clear jellies may serve as a medium for the use of extra fruit juice. Jellied desserts made with eggs and milk will be a medium for increasing protein. For a low calorie dessert, sucaryl or saccharin may be used.

General Directions for Gelatin Desserts

Unflavored gelatin should be softened in cold water, then dissolved in hot liquid or over hot water. The contents of one envelope of unflavored gelatin equal one tablespoon. Flavored gelatin should be prepared according to directions on package. It should be noted that fresh pineapple cannot be used in gelatin mixtures, although canned pineapple juice and fruit can be used successfully. Gelatin desserts are usually poured into molds and cooled somewhat before being placed in the refrigerator. The jelly will set completely in small molds in about 2 hours. It is not necessary to rinse the molds with water.

To unmold gelatin: Set mold in lukewarm water 1 minute. Loosen

edge of dessert with sharp knife. Wipe bottom of mold, place serving plate over mold and invert, shaking gently. If dessert does not loosen, return to lukewarm water for ½ minute.

When a jellied mixture is used as a base for fruit jellies and desserts made with milk and eggs, it should be chilled in the refrigerator until it begins to set; that is, when the consistency is somewhat like that of a thick syrup or an unbeaten egg white. After the remaining ingredients are added, the mixture is poured into a mold and placed in the refrigerator until firm.

Lemon Jelly

Ingredients:

- ½ tablespoon unflavored gelatin
- 2 tablespoons cold water
- ¼ cup boiling water
- 3 tablespoons sugar
- ½ cup cold water
- ¼ cup lemon juice

Procedure: Soften gelatin in cold water, add boiling water and stir until dissolved. Add sugar, stir until dissolved, add cold water and lemon juice. Strain and pour into molds. Chill in refrigerator until set and unmold according to general directions. Yield: 2 servings.

Snow Pudding

Procedure: Follow directions for lemon jelly. Chill until mixture begins to set. Beat until frothy. Add stiffly beaten egg white, continue beating until stiff enough to hold its shape. Chill and serve with custard sauce (see Soft Custard, p. 489).

Fruit Snow Pudding

Procedure: Fill sherbet glasses one-third full of snow pudding mixture. Arrange sections of peeled ripe pears or peaches on this and top with more of the pudding mixture.

Orange Jelly

Procedure: Follow preceding directions for lemon jelly, substituting ¼ cup orange juice for 3 tablespoons lemon juice.

Orange Charlotte

Procedure: Follow directions for orange jelly. Chill in refrigerator until jelly begins to set. Beat with rotary beater until frothy. Whip ¼ cup cream and fold into mixture. Pour into mold or sherbet glasses and place in refrigerator until firm.

NOTE: One stiffly beaten egg white may replace the whipped cream.

Jellied Fruit

Procedure: Follow directions for lemon jelly (above), reducing lemon juice to 2 tablespoons. Chill until jelly begins to set. Fold in ½ cup sliced fruit such as peaches, bananas, strawberries, raspberries, cut orange or grapefruit sections, stewed or canned apricots, prunes, canned peaches or pineapple. Not more than 3 fruits are usually combined.

Coffee Jelly

Ingredients:

- 2 teaspoons unflavored gelatin
- 2 tablespoons cold water
- 1 cup strong hot coffee
- ¼ cup sugar
- Dash salt

Procedure: Soften gelatin in cold water; add hot, freshly made coffee, sugar and salt; stir until dissolved. Pour into molds, chill until set. Unmold. Garnish with whipped cream. Yield: 2 servings.

Coffee Charlotte

Procedure: Follow directions for coffee jelly and finish preparation according to directions for Orange Charlotte.

Wine Jelly

Ingredients:

½ tablespoon unflavored gelatin
2 tablespoons cold water
¼ cup boiling water
3 tablespoons sugar
¼ cup orange juice
1 tablespoon lemon juice
¼ cup sherry wine

Procedure: Soften gelatin in cold water, add boiling water and stir until dissolved. Add sugar, fruit juices and wine. Strain and pour into molds. Chill until set. Unmold and garnish with whipped cream. Yield: 2 servings.

Spanish Cream

Ingredients:

1 cup milk
½ tablespoon unflavored gelatin
2 tablespoons cold water
1 egg
2 tablespoons sugar
Dash salt
½ teaspoon vanilla extract

Procedure: Scald milk. Soften gelatin in cold water and dissolve with scalded milk. Beat egg with sugar and salt, stir the hot mixture into this. Place in small double boiler and stir over hot water until mixture thickens slightly. Add vanilla extract and chill until mixture begins to set. Fold in stiffly beaten egg white and pour into bowl or sherbet glasses. Serve with whipped cream or sweetened crushed fruit. Yield: 3 servings.

Bavarian Cream

Procedure: Follow preceding directions for Spanish cream, substituting ¼ cup whipped cream for the stiffly beaten egg white.

Caramel Spanish Cream

Procedure: Follow directions for Spanish cream, substituting ¼ cup brown sugar, firmly packed, for 2 tablespoons sugar. The unmolded dessert may be garnished with whipped cream and toasted almonds, if desired. Undiluted evaporated milk may be substituted for the milk.

Mocha Spanish Cream

Procedure: Follow directions for Spanish cream. Add 1 teaspoon instant coffee to hot milk and mix well before adding to gelatin. Increase sugar to 3 tablespoons. Undiluted evaporated milk may be substituted for the milk.

Molasses Mousse

Ingredients:

2 teaspoons unflavored gelatin
2 tablespoons cold water
¾ cup (7 oz. can) undiluted evaporated milk
¼ cup molasses
1 teaspoon grated orange rind
2 teaspoons orange juice

Procedure: Soften gelatin in cold water. Scald half the milk, add to gelatin and stir until dissolved. Add molasses, orange rind and juice, chill until mixture begins to set. Whip remaining milk, which has been chilled several hours, and fold into gelatin mixture. Pour into molds and chill until set. Yield: 3 servings.

Frozen Desserts

Frozen desserts play an important part in the invalid's diet. Almost everyone likes ice cream and fruit ice, which are generally allowed in the liquid as well as in the lighter convalescent diets. It will almost never be necessary for the nurse to prepare a frozen dessert, as often ice cream and fruit ice can be purchased at most of the corner drugstores and confectionery stores. Naturally, only good-quality ice cream known to be made under sanitary conditions should be used. If it ever should be necessary for the nurse to make "turned" ice cream or to super-

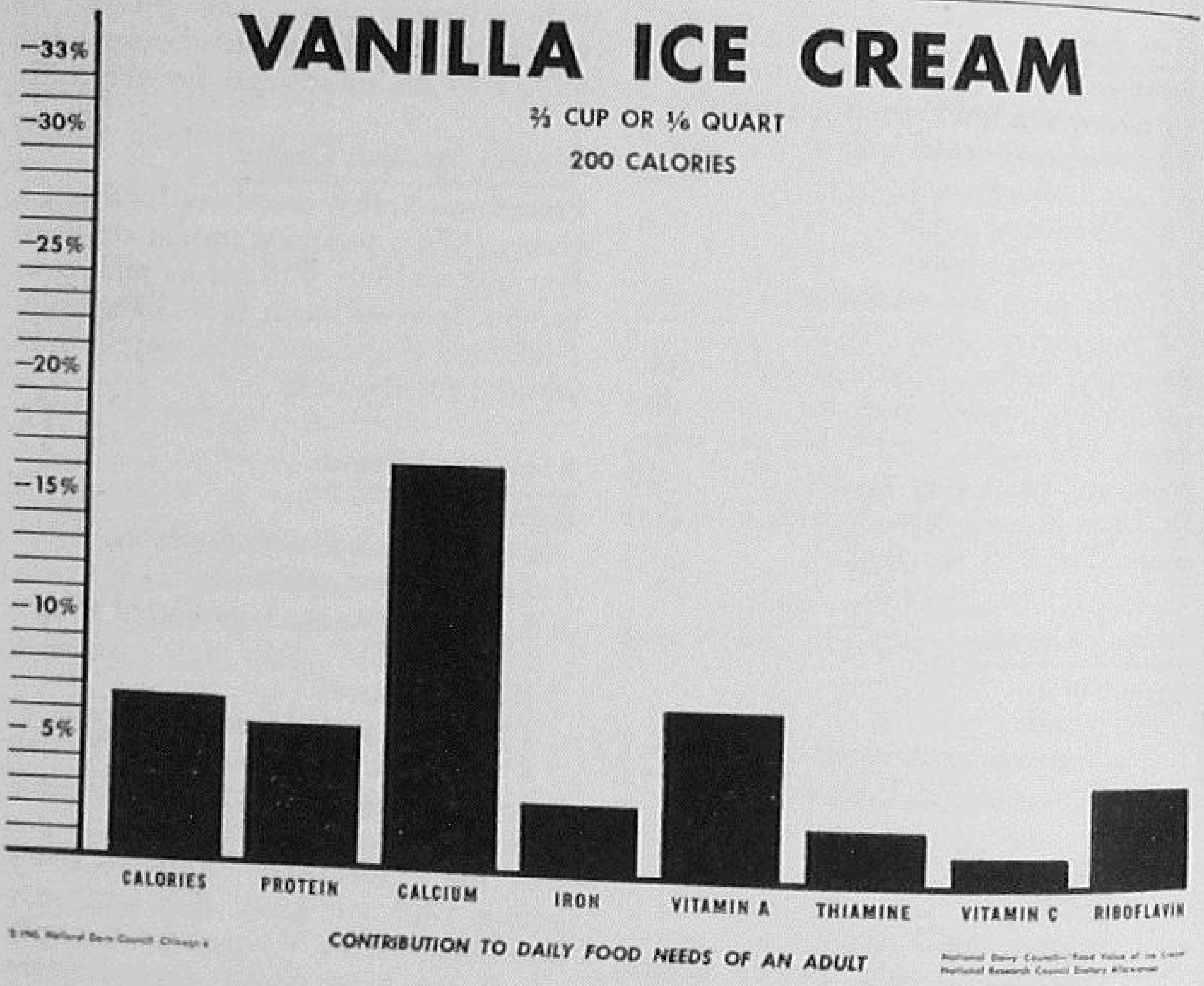


FIGURE 96

vise its preparation, a standard cookbook should be consulted. If made especially for the invalid, a pint freezer should be used. Acceptable desserts may also be frozen in the automatic refrigerator.

Ice Cream. If ice cream has been purchased near by and is not to be used immediately, it should be placed in the freezing compartment in the refrigerator. An exception should be made of ice cream packed in dry ice, which should be unpacked and allowed to soften slightly at room temperature.

Ice cream may be piled in a chilled sherbet glass or on a chilled plate. Vanilla ice cream may be varied by garnishing with sweet crushed fruit, such as strawberries, raspberries or peaches, or by using a chocolate sauce or butterscotch sauce (pp. 495 and 496).

Refrigerator Desserts. Special recipes are necessary for desserts which are to be frozen in an automatic refrigerator. Except in a "freezer" or in a special low-temperature compartment, these desserts cannot be prepared satisfactorily in very small quantities. Mixes especially designed for frozen dishes can be purchased or the following recipes may be used instead.

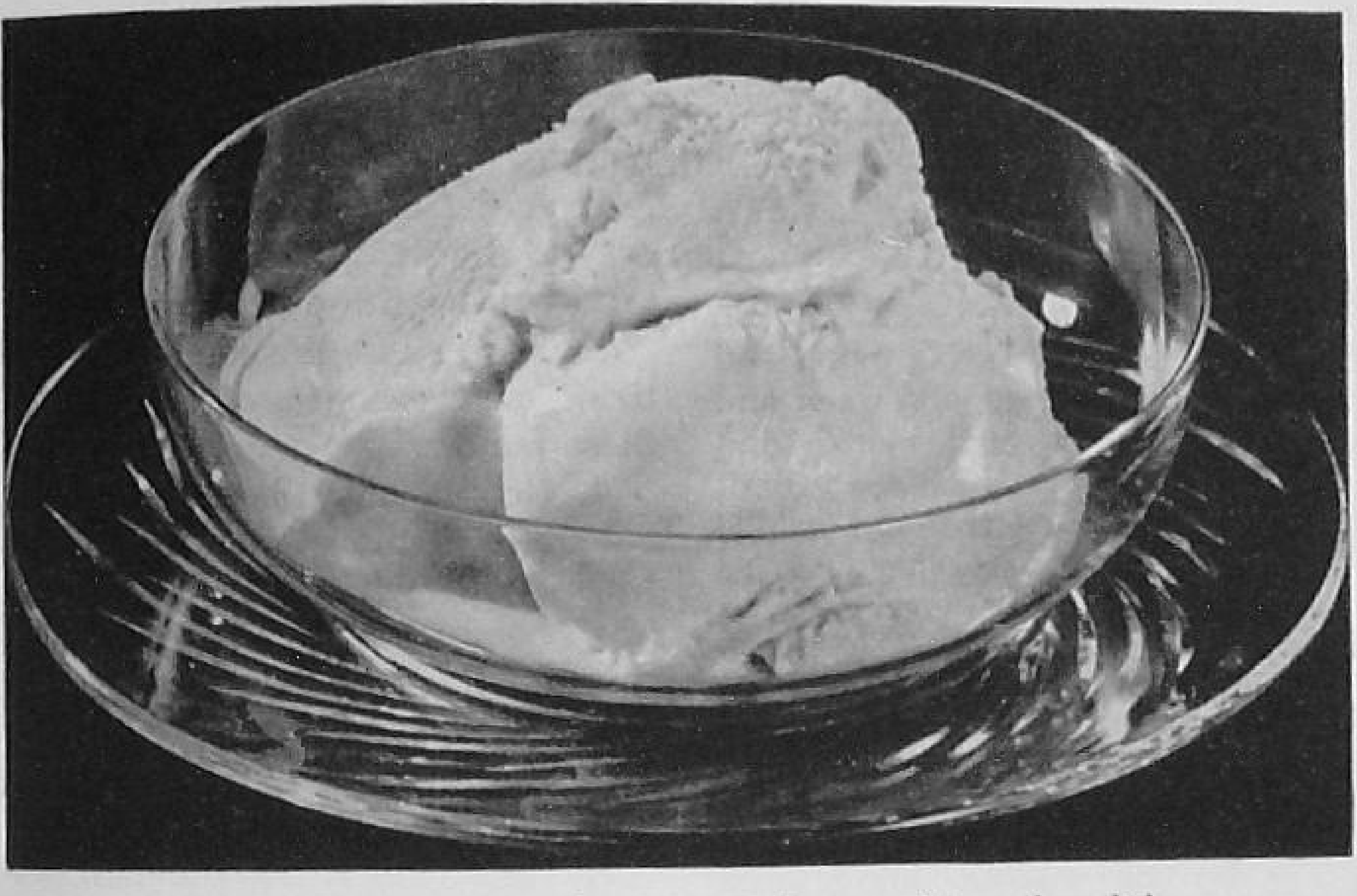


Fig. 97. Ice cream may be attractively served in a glass dish.

Vanilla Ice Cream (Automatic Refrigerator)

Ingredients:

⅔ cup (7½ oz. can) sweetened condensed milk
½ cup water
1½ teaspoons vanilla
1 cup heavy cream

Procedure: Mix sweetened condensed milk, water and vanilla. Chill. Whip cream to custard-like consistency. Fold into chilled mixture. Place in freezing unit or special compartment of refrigerator until half frozen. Scrape mixture into bowl. Beat until smooth but not melted. Replace in freezing unit until frozen. (Total time of freezing, from 2 to 4 hours.) Yield: 1½ pints.

Chocolate Ice Cream

Procedure: Follow preceding directions for vanilla ice cream. Add 1 square chocolate, cut in pieces, to milk and water, and heat over hot water, beating with rotary egg beater to blend well. Cool before adding other ingredients.

Coffee Ice Cream

Procedure: Follow directions for vanilla ice cream (above), substituting strong coffee for water. Decrease vanilla to ½ teaspoon.

Orange Ice Cream

Procedure: Follow preceding directions for vanilla ice cream (above), substituting orange juice for water and ½ teaspoon grated orange rind for the vanilla.

Sauces

Butterscotch Sauce

Ingredients:

1 egg yolk
½ cup brown sugar, firmly packed
1 tablespoon water
1 tablespoon butter

Procedure: Combine ingredients in top of small double boiler and mix thoroughly. Place over boiling water and stir until thick and smooth. Serve hot or cold. Beat well before serving. Yield: 3 servings.

Chocolate Sauce

Ingredients:

½ square chocolate
½ cup water
½ cup sugar
Dash salt
½ teaspoon vanilla extract
1 teaspoon butter

Procedure: Cut chocolate in pieces and place in small saucepan, add water and stir over low heat until smooth and thick. Add sugar and salt, stir until dissolved. Boil 1 minute, add vanilla extract and butter. Serve hot over ice cream, sponge cake or angel food. A ball of ice cream may be served with the cake. Yield: 3 servings.

Quick Chocolate Sauce

Procedure: Cut in small pieces half of a ¼-lb. bar milk chocolate into a small saucepan and stir over hot water until chocolate is melted.

STUDY QUESTIONS

1. Desserts can play an important place in the invalid's diet. For what reasons?

2. A dessert should be light and easy to digest. Which classes of desserts will fill these requirements?

3. Fruit desserts should be appetizing and easy to digest. Discuss these factors.

4. Gelatin may be used advantageously in the preparation of desserts. With what other foods is it often combined? What are the basic rules for the preparation of a gelatin dessert?

5. Custards are excellent desserts. Explain this statement.

6. Ice cream is the standard dessert in the diet for a convalescent. For what reasons?

Cheese

TYPES OF CHEESE
FOOD VALUE
DIGESTIBILITY
USE OF CHEESE IN THE MENU
PRINCIPLES OF COOKERY
RECIPES

The general term cheese is applied to any product made from the concentrated curd of milk. Cheese is considered to be the first manufactured food, the process for which was probably discovered accidentally when milk was stored in a bag made from the stomach of a cow, which contains rennin. The action of rennin upon milk causes the curds and the whey to separate. While a certain amount of the milk nutrients remains in the whey, the majority remains in the curd, which provides a large amount of the natural food value in milk in concentrated form.

Both food value and flavor of the many types of cheese which are available today depend upon the percentage composition and the methods of ripening which are used in production. The ancient rennet method is still used in modern cheese manufacture for some types of cheese, while for others the curd and the whey are separated by means of lactic acid through adding pure cultures of bacteria to the milk. While a very small amount of cheese is made in Europe from the milk of sheep and goats, cow's milk is the basis for the great majority of both domestic and foreign types of cheese.

TYPES OF CHEESE

Until comparatively recent times, and due perhaps to the abundance of meat in the United States, cheese was used more as an accessory than as a staple food.

Cheddar cheese was formerly known as "store" cheese, as it was the first commercial type, although there was always home production of cottage cheese. Now, however, the manufacture of cheese and cheese spreads has become a large commercial industry. Much of the cheese of the Cheddar type used in the United States today is processed and packaged. The processing, which includes pasteurization, produces a standard product. However, it lacks the pungent and the individual flavor of a fine Cheddar cheese prepared and allowed to ripen naturally. Some processed cheese is offered in the form of a spread to which whey, skimmed milk or butter fat has been added.

Cottage cheese, made from pasteurized skim milk, is next in order of consumption to Cheddar cheese. Because of the lack of fat, the caloric value is much lower than that of Cheddar. Some of the calcium is lost

in the process of manufacture, but it is still a good source of this mineral. Most of the vitamin A is also removed in the manufacture of butter and cream, of which cottage cheese is an important by-product, both from the nutrition and the economic standpoint.

Cream cheese, which, like cottage cheese, is not ripened and is, therefore, also a perishable product, is made from whole milk with a certain amount of cream added, which gives it a higher caloric value.

Luxury Cheeses. Other varieties of cheese, sometimes known as luxury or epicurean cheeses, are used more as an accessory to a meal than as a staple part of it. They account for not more than one eighth of the cheese production in the United States. With the exception of Liederkranz, which originated in this country, domestic products are called by the names of the foreign types of cheese which they closely resemble. The label bears the name of the country in which the cheese is manufactured.

All types of cheese can be counted upon to furnish flavor to a meal, whether the cheese is used as an ingredient of a dish or as an accompaniment.

FOOD VALUE

As has been stated in a previous chapter, milk is the best single food provided by nature. Lost in the process of the manufacture* of cheese are a small amount of the protein content, a portion of the milk sugar, certain mineral salts and some of the water-soluble vitamins. However, the retention of the large amount of protein and fat, calcium, phosphorus, riboflavin and vitamin A, except in cottage cheese, makes cheese a valuable food. The distinctive flavor characteristic of ripened cheese and its high protein content make it an unusually acceptable meat alternate. According to the softness or hard-

Composition of Portions of Common Varieties of Cheese, 100 Gm.*

	WATER	FOOD ENERGY	PROTEIN	FAT
Blue mold, domestic type	40.	368	21.5	30.5
Camembert	52.2	299	17.5	24.7
Cheddar	37.	398	25.0	32.2
Cheddar, processed	40.	370	23.2	29.9
Cheese foods, Cheddar	43.	326	20.5	24.0
Cottage, from skim milk	76.5	95	19.5	.5
Cream cheese	51.	371	9.0	37.0
Limburger	45.	345	21.2	28.0
Parmesan	30.	393	36.0	26.0
Swiss	39.	370	27.5	28.0
Swiss, processed	40.	355	26.4	26.9

* Adapted from Composition of Foods, Raw, Processed, Prepared, U.S. Department of Agriculture, Agriculture Handbook No. 8, June, 1950.

ness, the food value will vary inversely with the water content, as is illustrated by the table "Composition of Portions of Common Varieties of Cheese" on page 498. It will be noted that American Cheddar cheese, the type most commonly used in cooking and as an accessory, scores well on the list.

DIGESTIBILITY

In general, cheese is easily digested. However, the high fat content and the strong flavor of ripened cheese make it unsuitable in some conditions for use on the invalid's tray. Cottage and cream cheeses, because of their lower degree of concentration and milder flavor, can generally be used early in convalescence. Later, Cheddar cheese may be used in combination with other foods as an ingredient for a main dish or as a filling for a sandwich. One of the finer types of cheese accompanied by crackers may serve as a dessert. The serving of crackers or bread with cheese is good nutritional practice. The reputation for indigestibility which cheese has acquired is due to the habit of eating it in too large quantities at one time unaccompanied by other less highly flavored and less concentrated foods, or to taking it after a heavy meal. The favorite American dessert of pie

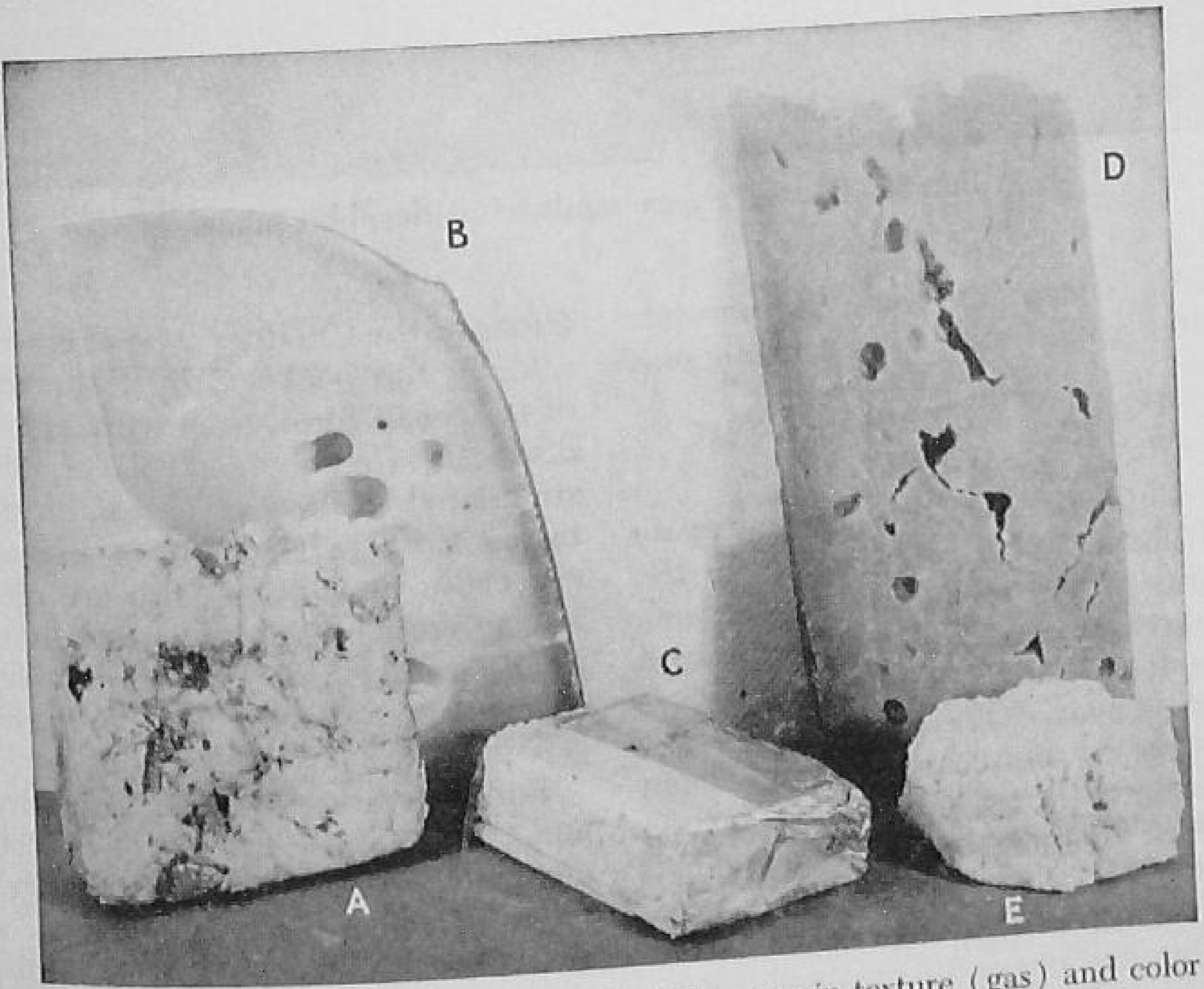


FIG. 98. Five common cheeses, with differences in texture (gas) and color due to micro-organisms: blue molds in Roquefort cheese (A) and gas-forming bacteria in Swiss (B) and creamery cheese (D). (C) Cream cheese. (E) Cottage cheese.

FIG. 99. Toasted cheese sandwich with rabbit sauce.

with cheese is more appropriate after a light meal than a heavy one.

USE OF CHEESE IN THE MENU

Until recently, little use was made of cheese as an ingredient or as the basis of the main dish for a meal. American cheese, sliced for use as a sandwich filling and cut in wedges for serving with pie, and cottage cheese as an accessory to the main course appeared occasionally on the table. Grated American cheese had some use as a flavoring for sauces, for macaroni and other foods and as a topping for certain creamed dishes. In some households it was used occasionally as a "rabbit."

The increased availability of variations of the Cheddar type of cheese, sold by the package, by the pound or in spread form, each with its own distinctive name and flavor, has stimulated the use of cheese on the table. Cottage and cream cheese, especially the former, also are used largely, often with green salads or as a stuffing for celery. Cottage cheese has some use also as an ingredient of a few cooked dishes.

Both because they are expensive and because most of them have such distinctive flavor, the fine "luxury" types of cheese are reserved as a general rule for serving after meals, although occasionally they appear with salad. For a special salad dressing Roquefort cheese is a favorite ingredient.

FIG. 100. Cheese soufflé.

PRINCIPLES OF COOKERY

When cheese is used in cooking it is usually grated or finely flaked, or, if soft, it is pressed through a strainer. When grated cheese is indicated in a recipe, sieved cheese may be substituted. For top-of-stove cooking, it is generally best to use a double boiler and to cook the cheese over hot water. For baked cheese dishes, a low temperature is generally used, and sometimes directions call for placing the dish containing the cheese mixture in a pan of hot water.

When a high temperature is used, as for instance in toasting an open cheese sandwich under the broiler, the cooking period should be short. The texture of cheese will toughen when it is overcooked by any method.

RECIPES

Cheese Soufflé

Ingredients:

- 2 tablespoons butter or margarine
- 2 tablespoons flour
- ¼ teaspoon salt
- ½ cup milk
- ¼ pound (1 cup) American cheese, flaked
- 2 egg yolks
- 2 egg whites, stiffly beaten

Procedure: Melt butter or margarine in a small saucepan. Stir in flour and salt. When smooth, stir in milk gradually. Continue stirring until sauce thickens and boils. Remove from heat, add cheese and stir until melted. Stir in egg yolks one at a time, beating after each addition. Fold into the stiffly beaten egg whites. Pour into greased 1-pint casserole and bake in slow oven (300° F.) 1 hour or in moderately hot oven (425° F.) 25 minutes. Yield: 2 generous servings.

Cheese Fondue

Ingredients:

⅓ cup milk
⅓ cup soft bread crumbs
¼ teaspoon salt
½ cup grated cheese
1 egg yolk, unbeaten
1 egg white, stiffly beaten

Procedure: Combine milk, bread crumbs and salt. Cook over low heat, stirring with a fork until mixture is smooth and bubbling. Remove from heat, add cheese and stir until well blended. Beat in unbeaten egg yolk. Fold in stiffly beaten egg white. Bake in greased 1-pint baking dish in moderate oven (350° F.) until golden brown (about 25 minutes). Yield: 2 servings.

Toasted Cheese

Ingredients:

½ cup grated cheese
⅛ teaspoon salt
½ teaspoon paprika
1 egg
½ cup milk

Procedure: Grease thoroughly a small pie pan or 4-inch au gratin dish. Grate cheese directly into baking dish. Add seasonings. Break egg over cheese, add milk and mix with a fork. Place in pan of hot water and bake in a moderate oven (375° F.) until set (about 15 to 20 minutes). Yield: 1 serving.

NOTE: ⅛ teaspoon mustard may be added.

Welsh Rabbit

Ingredients:

1 egg
¼ teaspoon salt
⅛ teaspoon paprika
2 tablespoons milk
½ cup grated cheese

Procedure: Break egg into top of small double boiler or small saucepan. Beat until foamy, stir in other ingredients and cook over hot water, stirring constantly until smooth and thick. Pour over toast and serve at once. Yield: 1 serving.

Tomato Rabbit

Ingredients:

½ cup grated cheese
½ cup condensed tomato soup

Procedure: Combine cheese and tomato soup in top of small double boiler or small saucepan. Stir over hot water until mixture is smooth and thick. Pour over toast and serve at once. Yield: 1 serving.

NOTE: This recipe may be used as a sauce for toasted cheese sandwich.

For other recipes using cheese, see Chapter 38 (Cereals, Macaroni, Noodle and Rice Recipes) and Chapter 48 (Breads, Toast and Sandwich Recipes).

STUDY QUESTIONS

1. List the types of cheese most commonly used. List the types of cheese which you have eaten.
2. Compare the food value of milk with cheese.
3. Give the reasons why cheese is considered to be a good meat substitute.
4. Which cheese is low in fat? Suggest recipes for its use.
5. Consult Table 1, Part Four, and list comparative contributions of milk, cheese and meat in regard to mineral content.
6. Discuss the digestibility of cheese. Why is it better to use cheese with bread or crackers?
7. Outline the principles of cheese cookery.

CHAPTER FORTY-THREE

Meats and Poultry

TRENDS IN MEAT CONSUMPTION
SAFE MEAT
TYPES OF MEAT
TYPES OF POULTRY
FOOD VALUE
DIGESTIBILITY
MEAT AND POULTRY IN THE MENU
GENERAL PRINCIPLES OF COOKERY
EFFECT OF COOKING ON FOOD VALUE
CARE AND PREPARATION OF MEAT
MEAT RECIPES
CHOICE AND PREPARATION OF POULTRY
POULTRY RECIPES
BROTHS, SOUPS AND JUICES

The term "meat" is used to cover poultry as well as the flesh of larger animals. Beef, lamb, mutton and pork are most commonly used. Meat is so generally liked that those who can afford it use it daily, with the possible exception of Friday. The preference for the flavor of meat, as well as its value as a food, makes it an important factor in the menu of most American families.

TRENDS IN MEAT CONSUMPTION

The consumption of meat has been comparatively heavy in the United States, although far less so than in pioneering days. Finding meat abundant and cheap, the settlers of the new lands made it a large part of their diet, to which it added savor as well as bulk. There was then a smaller variety of other foods available than at present. The rising costs of meats and the increased variety of other foods available in the markets have changed the emphasis on meat as a preponderant part of the diet. The reaction from the custom of eating meat at every meal lowered the consumption markedly and resulted in its being considered by some a luxury rather than a necessity. However, the experimental work of the past years has shown that it is difficult to obtain an adequate amount of protein of high quality without the use of a substantial amount of meat in the daily diet. As shown in Figure 104, there is no significant difference in the protein content of various types of meat.

SAFE MEAT

Meat is a protein food, and therefore special precautions must be used in slaughtering, storing and shipping. Because meat is often transported long distances, the Federal Government can enforce rigid inspection of the large meat companies which conduct interstate

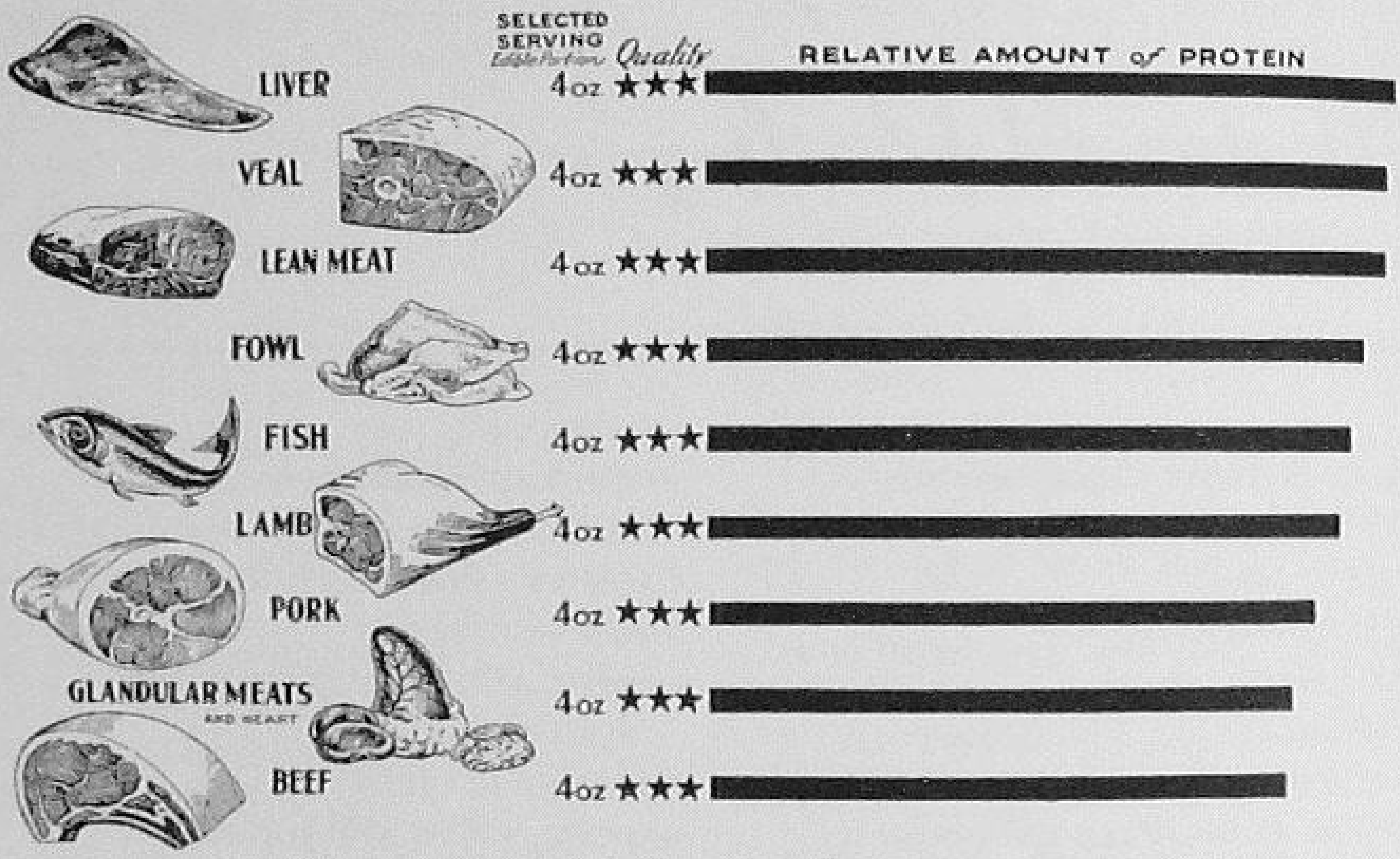


FIG. 101. Relative amounts of protein in 4-oz. servings. (National Livestock and Meat Board, Chicago)

business. Local authorities should do the same in the case of regional meat supplies. Modern methods for the initial cooling of meat after slaughtering and for cold storage make it possible for meat to "hang" long enough to become tender. Tenderness depends upon this period of hanging, as well as upon the age of the cattle and upon the way in which they were fed. The importance of the careful handling and refrigeration of meat cannot be overestimated, for very high bacterial counts have been reported for such meat products as sausages and hamburger, sometimes exceeding 1,000,000 bacteria per gram, especially where the meat is carelessly handled (soiled hands, dirty meat grinder, etc.) and is allowed to stand at room temperatures. (See Chap. 16.) For special precautions with regard to ensuring the safety of pork through long cooking see page 513.

Frozen meats, for which various cuts are trimmed and made ready for cooking, are now available in packaged form. While they may be cooked while still frozen, it is generally preferable to allow them to thaw slowly on the shelf of the refrigerator, or quickly at room temperature. If not to be used the day of purchase, frozen meat should be stored in freezing compartment of the refrigerator.

Meat in general should be stored loosely covered with paper in the refrigerator as soon as it comes from market. Ground meat and organs such as liver and kidneys which are highly perishable should be put in the freezing compartment if not to be used within a few hours. Cooked meat is less subject to spoilage than raw meat, but leftovers should be used within a reasonable time.

TYPES OF MEAT

Beef

Beef, coming as it does from such a large animal, varies greatly in its texture, and this means that special care must be taken in choosing cuts suitable for various purposes. The top cuts such as the loin, the top round and the ribs, are used for broiling and roasting. The chuck, bottom round from the forequarter, and the rump from the hindquarter are better pot roasted or stewed. Bony portions such as the shin and shoulder are used for soups.

When beef is used for invalids, a small club steak, a "minute" steak, thinly sliced from the round, or a piece of the tenderloin, or fillet which can be broiled quickly is usually chosen.

Beef, unlike other meats when either broiled or roasted, is generally preferred rare or medium.

Veal

Veal is the meat of a young calf not less than three weeks old at the time of slaughter. The best veal comes from milk-fed calves from six to eight weeks old. "Bob" veal, or veal that is less than three weeks old, is often soft and of poor flavor, and its sale is prohibited in many states, though experiments at the New York State Veterinary College, Cornell University, indicate that veal even a few days old is palatable and has no injurious effects. Veal and lamb may be used as soon as killed and dressed, as they are not improved by hanging.

Formerly, veal was considered more indigestible than beef, but experiments have shown that young veal is digested as easily as mature beef. Veal is lacking in flavor and fat, and for this reason fat may be added in the process of cooking. More seasoning should be added than for other meats. It should be cooked thoroughly to soften the large amount of connective tissue which it contains.

Lamb and Mutton

Lamb is the meat of the young sheep. Mutton is the meat of the mature animal. The dividing line between lamb and mutton is not based entirely on age. The meat from a well-bred and well-fed animal of one year or a year and a half may still be considered lamb, while the meat from a poorly fed animal of one year may be considered mutton. Lamb will be tender without a period of hanging, while mutton, like beef, should be hung to ripen.

For invalids, lamb chops, either loin or rib, are used more often than the other cuts, although a slice of meat from a well-done roast may be served. Chops should always be broiled, not fried.

Pork

Pork is the meat of the pig or hog and is used extensively throughout the world. A large amount of fat is embedded in the tissues of the hog, and pork contains more fat than any other meat. Therefore, it is more slowly digested. Fresh pork should have firm, pinkish white flesh, with firm, clear, white fat. Smoked pork, in the form of ham and bacon, is usually the only form of pork allowed for invalids.

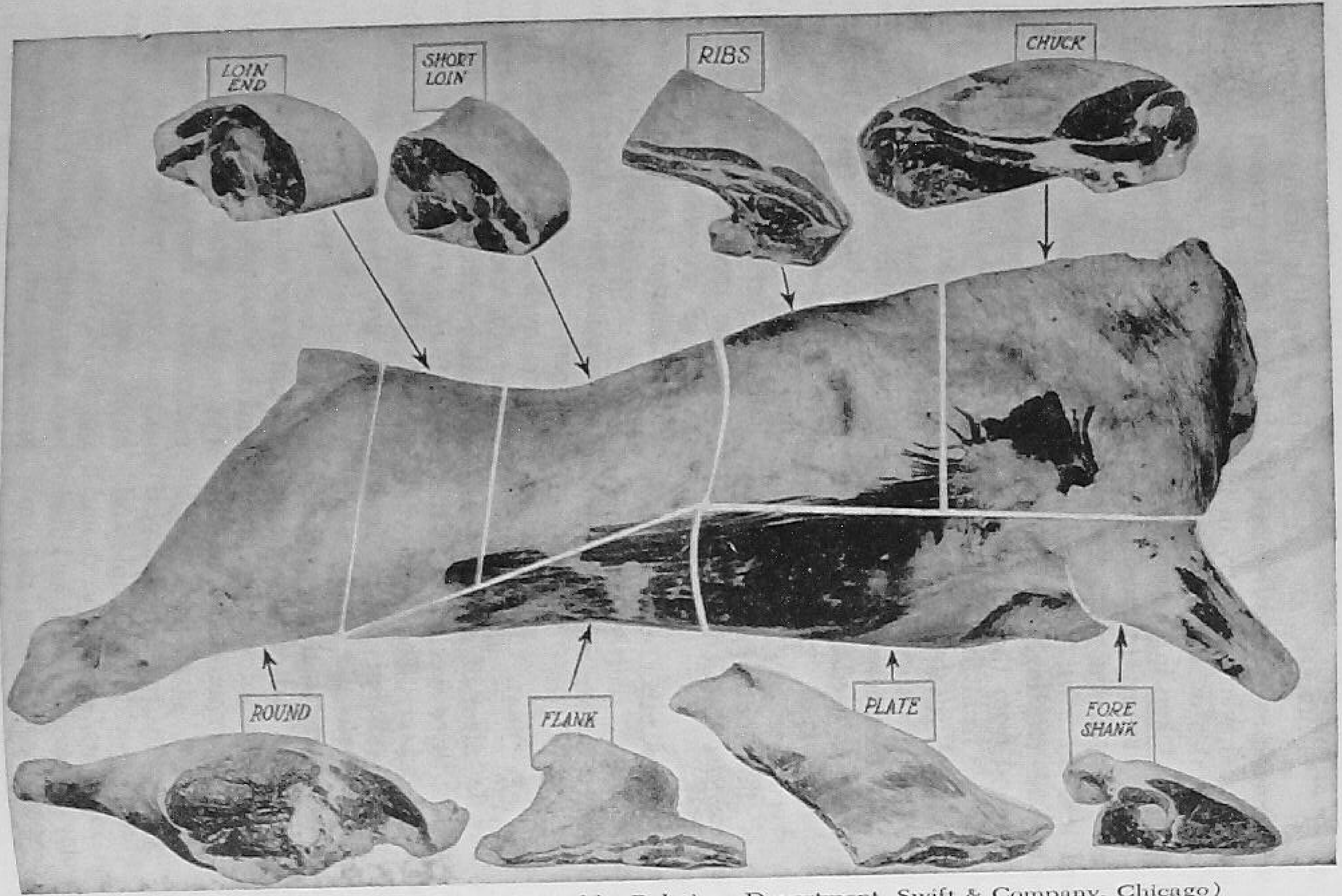


FIG. 102. The various cuts of beef. (Public Relations Department, Swift & Company, Chicago)

Variety Meats

The organs and the glands of animals are known as variety meat or sundries. Among these, tongue has long been a staple. Next to this, the most commonly used has been the liver. The discovery that this organ was so high in food value, especially in its contribution of iron and certain vitamins, caused a large demand for it. The price of delicate calf's liver doubled and tripled. This caused increased use of beef liver. Lamb and pig liver, which have always been used to some extent, are now more in demand. Next in popularity to liver are veal and lamb kidneys but beef kidney, which is generally less expensive, is also used. Sweetbreads have always been considered a delicacy, especially for the invalid. Their source is the thymus gland of the calf and the lamb. Lamb sweetbreads are so small that they are seldom seen in market. The pancreas, which is sometimes known as the stomach sweetbread, is occasionally available.

Other portions, which belong in this classification of variety meats are heart from the calf or beef, tripe which is obtained from the fatty interlining of the stomach of the beef or calf, and brains which are somewhat like sweetbreads in texture and in flavor.

TYPES OF POULTRY

Chickens, geese, ducks and turkeys are the common domestic birds used as food, although chickens are the most plentiful among fowls. Capons (male birds castrated at an early age) are highly prized for their fine flavor and large proportion of light meat. Guinea hen, squab, partridges and other game are luxuries used when obtainable. Because of modern methods of incubation, chickens may be hatched and marketed at any time of the year, so that broilers and fryers are no longer limited to the spring output. In many places it is now possible to buy various parts of chicken, and this is particularly convenient in cooking for the invalid.

The quality of poultry has been standardized to a great extent by modern methods of breeding, care and feeding. Modern methods produce birds with a higher proportion of meat, and tenderness is assured through prevention of exercise. Some birds raised on farms are sold to packing houses, where they are given a final feeding to make them ready for market. Poultry is shipped in both live and dressed form. New methods of killing, picking and cooling protect the dressed birds from contamination. They come to market in both fresh-killed and frozen form. With the new methods of fast freezing, frozen poultry may be of as high quality as that of the best fresh-killed bird. However, it should be kept frozen at the market. As poultry is as perishable as meat in general, it should be given the same care after it reaches the home kitchen.

Chickens, the most largely used type of poultry, are known by various terms which indicate size and, to some extent, tenderness. This is shown in the accompanying chart.

Squab	¾-1¼ lbs.
Broiler	1¼-2½ lbs.
Fryer	2½-3½ lbs.
Roaster	3 lbs. or over
Fowl	4 lbs. or over

The quality of poultry depends

upon the texture and the flavor of the flesh, as well as upon the distribution of flesh and fat on the carcass. Exercise affects the flavor and the texture of the meat, for with exercise the fibers and the connective tissue are toughened, and the extractives are increased. A chicken that has been allowed to run will develop tough leg muscles and have a lessened amount of tender or white meat. The age of a chicken determines its flavor to a large extent—at first, advantageously, and afterwards disadvantageously.

Tests for Poultry

Breast. The breast bone should be flexible. A good table bird should have a large proportion of flesh in relation to the size of bone. The breast should be large and full.

Head. The comb should be red, the eyes clear and full, and there should be no sores on the head. With modern improved methods of breeding, handling and grading poultry, however, unhealthy birds seldom reach a market of good reputation.

Legs. Long thin legs are undesirable, as there is too little meat for the amount of bone.

Skin. The skin should be dry and firm, showing that the chicken has been dry-picked. Chickens that have been scalded will show patches. The color of the skin bears no relation to its quality. Birds with light feathers are easier to make attractive for market than those with dark, but the color of the feathers is not indicative of the quality. Hairs on the skin of a chicken are a sign of age.

Feet. In freshly killed and in young birds the feet feel moist, soft and limber. As the chicken becomes older, the feet become firmer and harder. The feet should not be scaly. Chickens have soft spurs, and roosters have hard spurs. The toes of a chicken should not be blunt, as this is a sign of old age.

Fat. Young chickens are seldom fat. Fat should be distributed fairly evenly throughout the carcass, as this develops the flavor of the chicken when cooked. There should be thin streaks of fat under the skin of the breast, but it is not desirable to have any large masses of fat on the chicken.

Wings. The wing bones should be tender and should spring back into place when pulled out.

FOOD VALUE

The largest contribution of meat to the diet lies in the fact that it provides protein of high quality that can be readily digested and utilized. At the same time, meat furnishes an appreciable amount of phosphorus and iron. These constituents vary in amount in ratio to the fat and the lean content, as they are found only in lean tissue. All the internal organs of all animals are much richer in iron than are the ordinary cuts of meat.

As far as vitamin content is concerned, meats in general are good sources of the B complex, especially thiamine and niacin. The internal organs such as liver and kidney are richer in vitamins than the muscle tissue. Research work indicates that lean pork is much higher in thiamine than are other meats. Liver is an exceedingly good source of vitamin A, and it also contributes some vitamin C and B complex.

Meat rationing during World

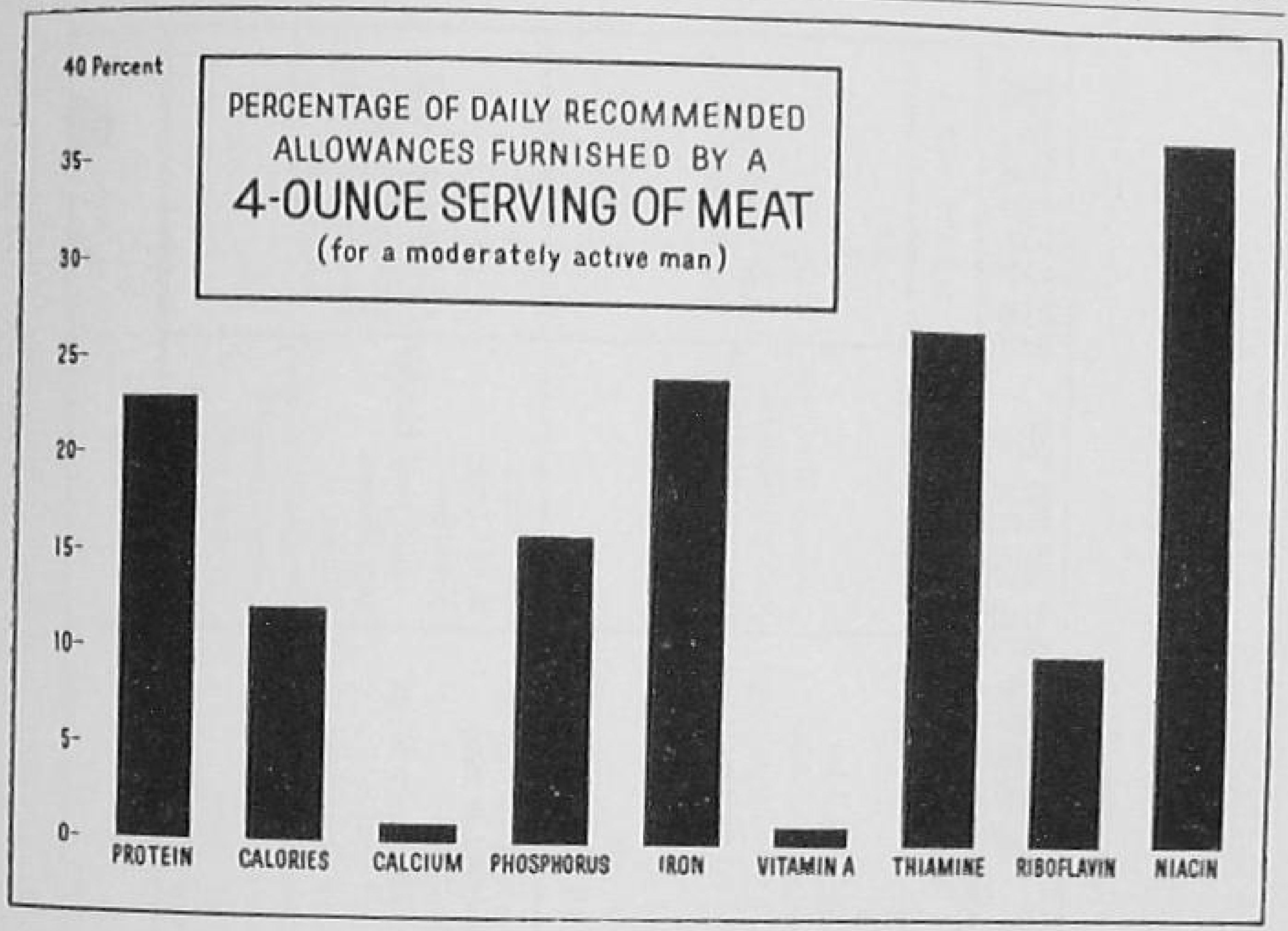


FIGURE 103
(National Livestock and Meat Board, Chicago)

War II and the scarcity afterward pointed up the contribution of meat in the daily diet. While it was possible to supply protein enough to supplement the meat available with other protein-bearing foods, the preference for meat is so great that it is difficult to plan satisfying and adequate meals without its use. Figure 106 shows the percentage of daily recommended allowances of minerals and vitamins as well as protein furnished by a 4-oz. serving of meat. Research still in progress indicates that there may be reasons for the use of meat or other good-quality protein-bearing foods not fully recognized at present.

DIGESTIBILITY

The high coefficient of digestibility, from 97 to 98 per cent, is an asset which meat shares with milk and eggs. It is digested not only completely but rapidly. The products developed during the ripening process, upon which meat depends for its flavor, may play some part in promoting digestion. Ripening also makes the fibers more tender. Scientific opinion, which some years ago was generally in favor of a limited supply of meat in the diet, has changed in favor of a more liberal amount in view of more recent research.

Little importance is attached to the fact that meats contain an excess of acid-forming over base-forming elements, or to the fact that meat protein is more susceptible to intestinal putrefaction than are other

HOUSEWIFE'S MEAT COOKERY GUIDE

COOKING METHODS	BEEF CUTS	VEAL CUTS	PORK CUTS	LAMB CUTS	VARIETY MEATS
ROASTING	Standing Rib Rolled Rib Sirloin Chuck Ribs *(high quality)* Rump *(high quality)* Round *(high quality)* Loaf	Rolled Shoulder Cushion Shoulder Arm Roast Blade Roast Rib Loin Rump Leg	Loin Rolled Shoulder Cushion Shoulder Fresh Ham *(pork leg)* Smoked Picnic Smoked Shoulder Butt Smoked Ham Sausages Sliced Salt Pork	Cushion Shoulder Rolled Shoulder Breast with Pocket Rolled Breast Rack	Liver *(beef-veal pork-lamb)*
BROILING and PANBROILING	Rib Steaks Club Steaks T-Bone Steaks Porterhouse Steaks Sirloin Steaks Chuck Steaks *(high quality)* Rump Steaks *(high quality)* Patties	*Veal is not broiled or pan-broiled*	*Fresh pork is not broiled or pan-broiled* Smoked Ham Slices Sliced Bacon Sliced Canadian Style Bacon Smoked Shoulder Butt Slices Sliced Salt Pork	Rib Chops Loin Chops Shoulder *(arm and blade)* Leg Steaks Patties Choplets *(from breast stuffed with ground lamb)*	Liver *(veal-lamb)* Kidney *(lamb)* Sweetbreads *(beef-veal-lamb)*

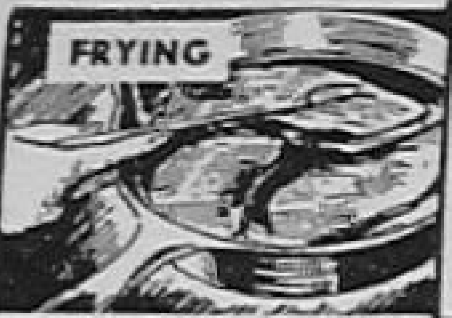
	Thin Steaks *(tender or pounded)* Patties	Chops Cutlets Steaks Patties	Chops Sausage	Thin Chops	Liver *(all kinds if cut thin)* Tripe *(after pre-cooking in water)* Sweetbreads Brains
	Chuck *(arm and blade)* Rump Round Heel of Round Brisket Plate Short Ribs Flank Shanks Ox-joints	Breast Rib Chops Loin Chops Shoulder Steaks Cutlets Patties	Rib Chops Loin Chops Shoulder Chops or Steaks Fresh Ham Slices	Breast Neck Slices Shanks Riblets	Liver *(beef-pork)* Kidney *(beef-veal-pork)* Heart *(beef-veal-pork-lamb)* Tripe *(beef)* Sweetbreads *(beef-veal-lamb)*
	Neck Shank Plate Brisket Flank Heel of Round Ox-joints Corned Beef	Neck Shoulder Shanks Flank	Hocks Shanks Feet Backbones Neck Bones Spareribs Smoked Picnic Smoked Shoulder Butt Smoked Ham Shanks Smoked Spareribs Smoked Hocks	Neck Steaks Shoulder Breast	Kidney *(beef-veal-pork-lamb)* Heart *(beef-veal-pork-lamb)* Tongue *(beef-veal-pork-lamb)* Tripe *(beef)* Sweetbreads *(for pre-cooking)* Brains *(for pre-cooking)*

FIG. 104. (National Livestock and Meat Board, Chicago)

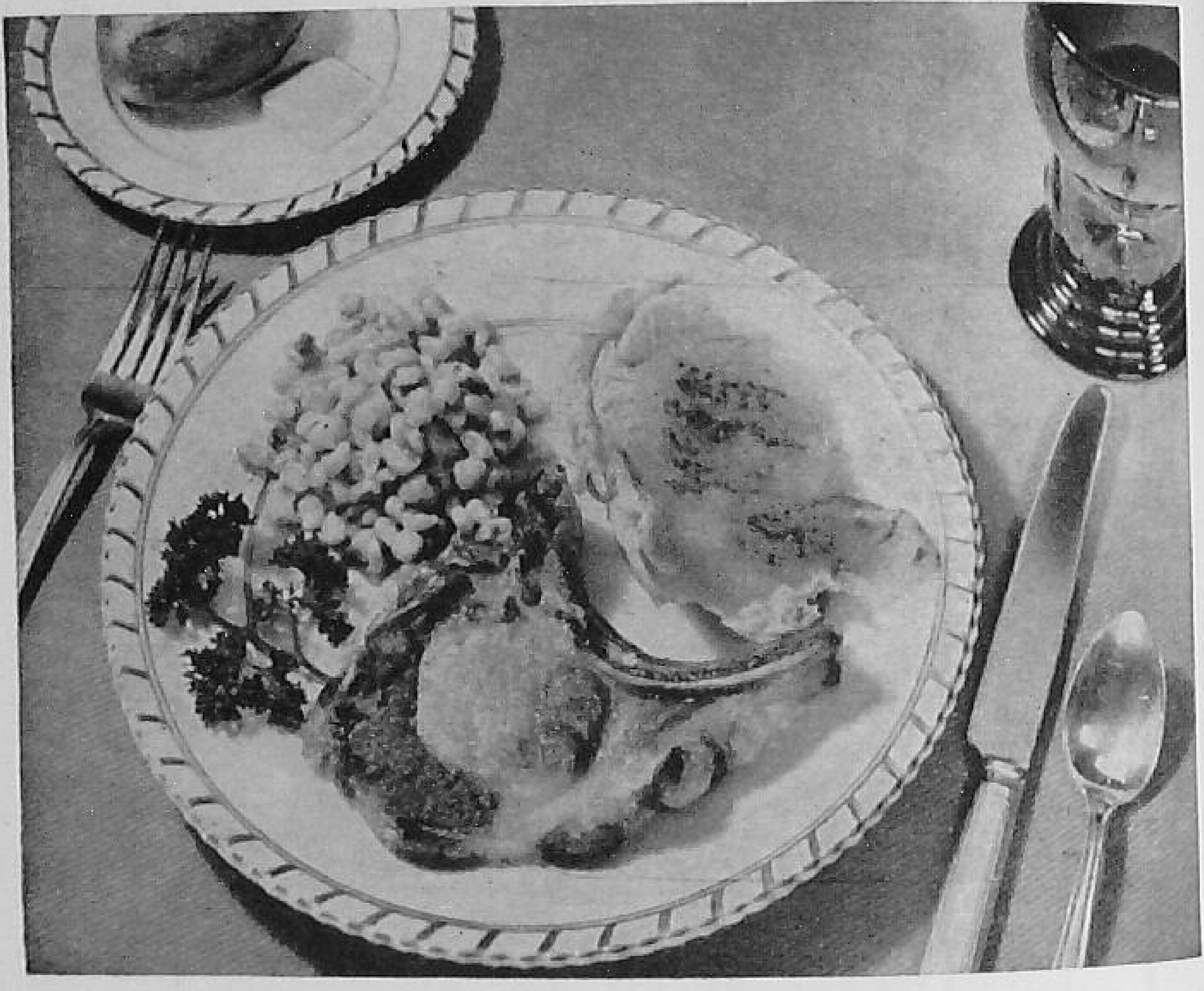


FIG. 105. Braised pork chop with apple sauce and corn stuffing.

proteins. These characteristics may be of importance in certain abnormal conditions but need not be considered in the normal diet. The present cost of meat makes it unlikely that the quantity in the diet will be large enough to interfere with the consumption of other important foods.

Because so much of the poultry is bone, it is an expensive source of protein; but because of its flavor, which is so well liked by practically everyone, it holds a place of honor among the delicacies of the table. Since it pleases the palate and because it is easily digested, chicken is used in the diet of the invalid more often than other meats. It is sometimes a very valuable asset in tempting the appetite. White meat is slightly more easily digested than dark, because the fibers are held together less firmly and because there is less fat in white meat. There is no support for the opinion that dark meat produces more uric acid than white.

MEAT AND POULTRY IN THE MENU

Under the general term meat, poultry is included with beef, veal,

lamb and pork. Some form of meat will be served the patient at least once a day during convalescence, unless there is some specific reason for its exclusion from the diet. This is rarely the case under modern conceptions of nutrition. If the patient is fond of meat and it is necessary to tempt the appetite, it may be used at both the noon and the evening meal.

Fresh pork is excluded from the diet of the critically ill patient, because of the fat content, which may render it difficult to digest. It may be used occasionally in cases where there are no special diet restrictions if the patient desires it. (Because pork may transmit trichinae, causing trichinosis, it must always be well cooked.) Smoked pork, such as ham or bacon, may be used interchangeably with other meats unless there is some reason for excluding salt or fat. Among poultry, duck may be forbidden on account of its fat.

Meat for the patient's meals should be planned with reference to the family table. A slice of meat from the roast or a portion of poultry will be a pleasant variation from the chop and the steaks which necessarily must be chosen when the nurse cooks meat especially for the invalid's tray. In addition to the specific directions for broiling steaks and chops and for the preparation of the glandular meats such as liver, kidney and sweetbreads, often included in the diet of the convalescent, general directions for roasting are given, as it may be necessary for the nurse to supervise such processes.

GENERAL PRINCIPLES OF COOKERY

Meat. In cooking meat, two principles should be observed in the interest of flavor and texture. Tender cuts, if the flavor is to be preserved, should be cooked without water, which its texture does not demand. Broiling and roasting are the accepted methods for these cuts. A constant low temperature of approximately 300 to 325° F. is now generally recommended for roasting in order to prevent shrinkage and to produce consistent results. This is particularly important in cooking large quantities. When a high temperature is used at first, it should be lowered to 350° F. after the meat is browned. Uncovered pans should be used for roasting. For less tender cuts, the use of some liquid is necessary. Pot roasts are often seared by browning in hot fat before the liquid is added and cooking is continued in a covered utensil. For soups, where the aim is to draw the flavor into the liquid, part of the meat may be seared for flavor and the remainder put directly into cold water and simmered for a long time, the pot being covered for the first portion of the cooking.

Pork. Fresh pork should be cooked until every vestige of pink coloring in the flesh has disappeared. Particular care should be taken to follow directions for cooking which come with the tenderized smoked hams now so generally distributed. The meat itself becomes tender enough to eat before the cooking process has been sufficient to kill trichina spiralis which may be present. Un-

like any other food animal, a pig or a hog is susceptible to trichinosis, which may be passed on to humans if measures to kill any parasites present are omitted. As the presence of these is not apparent, there is no way of judging whether pork contains them until some time after it has been eaten and symptoms of trichinosis appear. Under the present methods of production and slaughtering, the only insurance is thorough cooking in the home kitchen.

EFFECT OF COOKING ON FOOD VALUE

As practically all meat is eaten in cooked form, research has been concerned with the loss of natural vitamin content in cooking. Study of the Chart "Range of Vitamin Values for Raw and Cooked Meats" shows the differences which heat treatment makes in the vitamin value of the various kinds of meat.

Experiments have also shown that various vitamins in various cuts of meat are affected differently by the same methods of cooking. Frying, for instance, does not reduce the thiamine content, but it has some effect upon riboflavin and more on niacin. On the other hand, braising and stewing reduce thiamine to a greater extent than they do riboflavin and niacin. Results from roasting and broiling are about the same with regard to all three of the vitamins. (See Fig. 109.)

Soups prepared from meat and bones have very little food value. The extractives, which are soluble, are drawn out by cooking in water and contribute flavor to the stock in ratio to its concentration. The small amount of protein is in the form of gelatin. Soups made with meat stock are appetizing rather than nourishing.

RANGE OF VITAMIN VALUES FOR RAW AND COOKED MEATS*

(Common cuts and various methods of Cooking. See Table 1, Part Four, for vitamin values of specific cooked cuts.)

EDIBLE PORTION MEDIUM FAT	THIAMINE mcg.	RIBO-FLAVIN mcg.	NIACIN mcg.
Beef			
raw	100–120	120–160	4.2–5.2
cooked	35–85	90–150	3.0–5.0
Lamb			
raw	180–210	230–260	5.2–5.9
cooked	125–150	200–260	3.6–5.4
Pork, fresh			
raw	920–1,040	180–210	3.9–4.5
cooked	660–810	160–190	3.1–4.2
Pork, cured (ham)			
raw	650	210	4.1
cooked	540	175	3.4
Veal			
raw	170–180	260–280	6.0–6.4
cooked	75–140	230–260	5.5–6.1

* Food and Nutrition Board, Table of Vitamin Losses in Cooking, 1944.
U. S. Department of Agriculture Table of Food Composition, Misc. Pub. No. 572.
National Live Stock and Meat Board, Food and Nutrition News, January, 1946.

CARE AND PREPARATION OF MEAT

All fresh and cooked meat must be stored in the refrigerator. Fresh meat and poultry should be lightly but not tightly covered with waxed paper. Chopped meat and glandular meats should be used the day they are purchased or stored in the freezing compartment of the refrigerator. Leftover cooked meat should be

covered before storing on the shelf of the refrigerator and should be put to use within a reasonable time before there is the slightest change in flavor.

Quick frozen meats, of which chicken is the most commonly used, will defrost in from three to four hours at room temperature. If they are not to be used on the day of purchase, they should be stored in the freezing compartment of the refrigerator. No attempts should be made to refreeze after thawing. If only a portion of a carton is required, that portion should be cut off and allowed to thaw and the remainder should be placed at once in the freezing compartment.

Broiling and roasting are the two

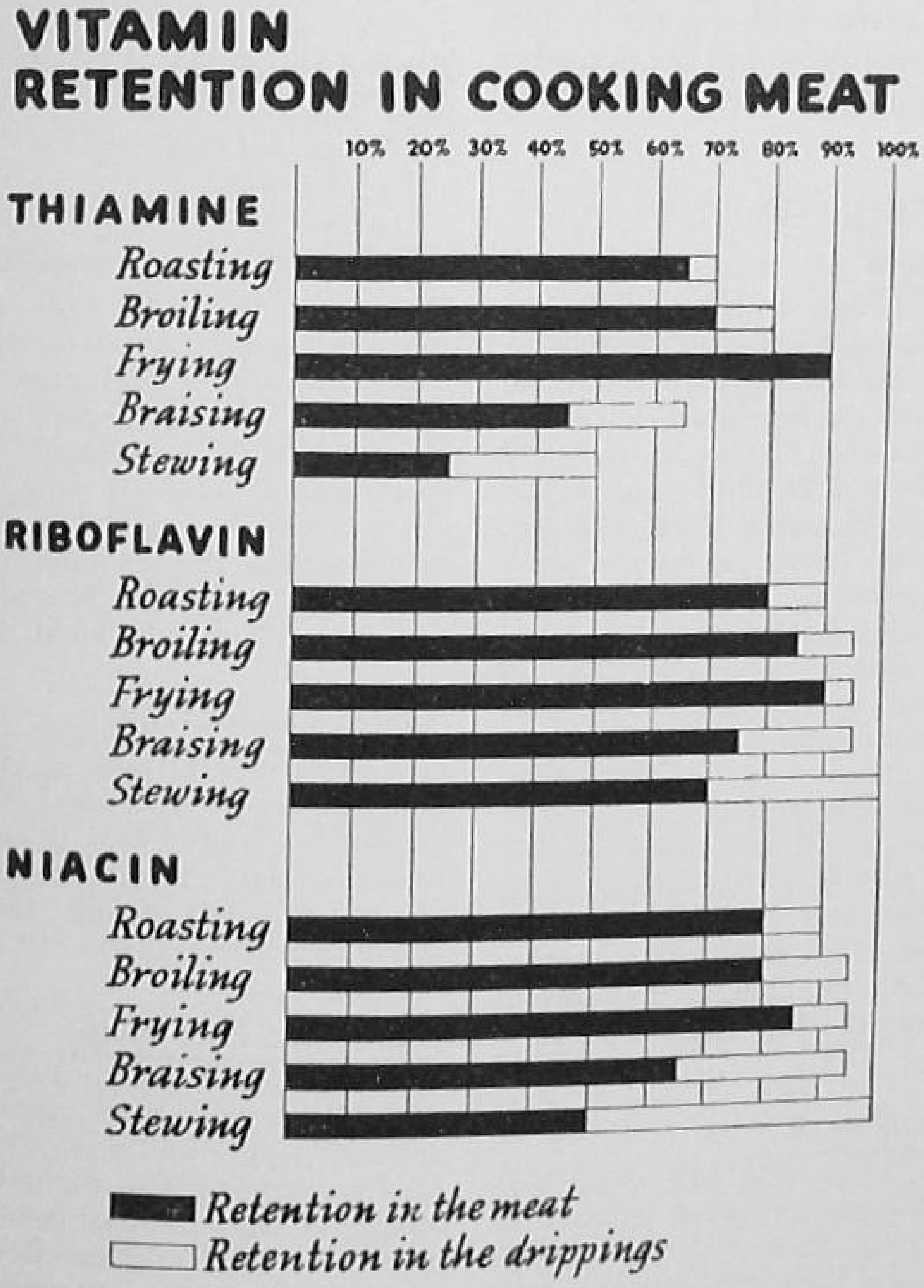


FIGURE 106
(National Livestock and Meat Board, Chicago)

methods generally used in the preparation of meat for the patient. For the former, the preheated broiling oven or preheated small, heavy frying pan may be used. As roasting is suitable only for a large portion of meat, this method will seldom be used by the nurse in preparing meals for her patient. However, roasting methods are included among the recipes, as the nurse may be called upon to advise with regard to the proper preparation, and she may also find them useful in her own cooking problems.

MEAT RECIPES

Broiled Steak

Procedure: If only 1 portion of steak is to be prepared, a cut from the tenderloin is generally used. Allow from ¼ to ½ lb. for each serving. Small club steaks are delicious when broiled, but they will weigh at least 1 lb. Steaks are usually cut at least 1½ inches thick, although very thin steak known as "minute" steak may be cooked by a special method. Allow ¼ lb. for a serving.

Preheat broiling oven from 5 to 10 minutes and grease rack. Wipe meat with cloth and broil from 2 to 3 inches below heat. Sear meat on both sides, reduce heat and continue cooking, turning occasionally. If an electric range is used, the door of the broiler should be left slightly open. For rare steak 1½ inches thick allow from 12 to 15 minutes. Sprinkle both sides with salt and pepper, spread with softened butter if desired.

Pan-broiled Steak

Procedure: Wipe meat with cloth; heat heavy frying pan and grease lightly with fat from meat. Place steak in pan, cook 1 minute over high heat, turn and cook 1 minute, lower heat and continue cooking from 8 to 10 minutes, turning often. Pour off fat as it accumulates in pan. Sprinkle both sides with salt and pepper, spread with softened butter if desired.

Minute Steak

Procedure: Heat heavy frying pan until very hot and grease liberally. Sear steak quickly on both sides, lower heat and cook 2 minutes on each side. Sprinkle with salt and pepper, spread with softened butter if desired.

Broiled Hamburg

Ingredients:
- ¼ lb. ground beef
- ⅛ teaspoon salt
- Dash pepper
- ½ teaspoon cream or evaporated milk

Procedure: Mix beef with seasonings and moisten with cream or evaporated milk. Form into a thick cake. Make an indentation in the center and broil under moderate heat about 7 minutes on each side. Serve on warm plate and place 1 teaspoon catsup or chili sauce in indentation. The meat may be formed into 2 thin cakes and broiled about 3 minutes on each side. Yield: 1 serving.

Broiled Lamb Chops

Procedure: Select loin or rib chops, single or double as desired. Follow directions for broiled steak or pan-broiled steak. For single chops allow from 12 to 15 minutes. For double chops from about 15 to 20 minutes.

Pan-broiled Pork Chops

Procedure: Have chops cut about 1 inch thick. Wipe with cloth, sprinkle with salt and pepper and dredge with flour. Heat heavy frying pan and brown chops lightly on both sides in their own fat, turning frequently. Pour off excess fat as chops cook. Cover and cook over very low heat from 25 to 30 minutes (until tender)

Broiled Ham

Procedure: Preheat broiling oven 5 minutes. Trim skin and wipe meat with cloth, cut fat round edge in several places. Broil 3 inches below moderate heat, turning occasionally. Allow 10 minutes for slice ¾ inch thick and 20 minutes for one ½ inch thick. After ham is broiled it may be sprinkled with brown sugar and returned to broiler just long enough to melt the sugar. Allow ¼ lb. for each serving.

Pan-broiled Ham

Procedure: Trim skin and wipe meat with cloth, cut fat round edge in several places. Heat heavy frying pan and grease with fat from ham. Cook over moderate heat, turning often until well browned. Allow ¼ lb. for 1 serving.

Veal Steak

Procedure: Select veal steak cut ½ inch thick. Dredge with flour, salt and pepper, and sauté in a small amount of butter or bacon fat, turning constantly until brown. Add ½ cup water, cover and simmer from 20 to 30 minutes (until tender). Allow ¼ lb. for 1 serving.

Roasting

Tender cuts of meat such as ribs of beef, rack or leg of lamb, veal and pork are usually chosen for roasting. Shoulder of lamb, pork and veal are also roasted. An allowance of ½ lb. of meat per serving is generally made.

General Directions for Roasting

Wipe meat with cloth, rub with salt and pepper and place fat side up in uncovered roaster. If meat thermometer is used, make a hole with skewer through fat side and insert thermometer in center of roast but do not let it touch the bone. Preheat oven to 325° F. Roast at this moderately slow temperature. For any rolled boned roast increase time allowance 10 minutes per lb. according to directions for each type of roast.

Roast Beef

Procedure: For rare roast beef allow from 21 to 25 minutes per lb., or until meat thermometer reads 140° F. For medium roast beef allow from 27 to 35 minutes per lb., or until thermometer reads 160° F. For well-done roast beef allow from 33 to 40 minutes per lb., or until thermometer reads 170° F.

Roast Lamb

Procedure: For medium roast lamb allow from 32 to 35 minutes per lb., or until meat thermometer reads 180° F. For well-done roast lamb allow from 40 to 45 minutes per lb., or until thermometer reads 185° F.

Roast Fresh Pork

Procedure: Allow 45 minutes per lb., or until meat thermometer reads 185° F.

Roast Veal

Procedure: Allow 30 minutes per lb. or until thermometer reads 170° F.

Baked Ham

Most hams on the market today have been tenderized during curing. They may be baked without previous soaking or boiling, except in the case of "country ham." If directions are given on the wrapper, they should be followed exactly. The full time allowance must be given, as underdone ham may transmit trichinae. An allowance of 25 minutes per pound is generally made, or until the meat thermometer reads 160° F. Take ham from oven, remove skin, spread with paste made from a mixture of brown sugar and prepared mustard and return to oven for 30 minutes. Baste occasionally with the syrup which accumulates in the bottom of the pan.

Brown Gravy for Roasts

Ingredients:
- ¼ cup drippings from roast
- 5 tablespoons flour
- 2 cups cold water or stock
- Salt
- Pepper

Procedure: Remove roast to hot platter. Pour off drippings if they exceed more than ¼ cup. Add flour and stir until thoroughly mixed with drippings. Continue stirring until flour is browned. Add water or stock slowly, stirring constantly. Stir over low heat until gravy thickens and boils. Add salt and pepper to taste. Yield: 2 cups gravy.

NOTE: If a small amount is to be made, place required amount of drippings in a small frying pan, reduce flour and water accordingly and follow directions.

MISCELLANEOUS

Bacon

Bacon may be pan-fried, broiled or baked. When 1 portion is prepared for the invalid's tray the pan-frying method will be used generally. Usually from 2 to 3 strips of bacon are allowed for each serving.

Baked Bacon

Procedure: Arrange strips of bacon in baking pan. Bake in moderately hot oven (400° F.) until golden brown. Drain on soft paper.

Pan-fried Bacon

Procedure: Place bacon without separating into strips in cold frying pan. Cook over low heat 2 or 3 minutes. Separate strips and turn occasionally until golden brown. Drain on soft paper.

Broiled Kidneys

Procedure: Choose 1 veal kidney or 2 lamb kidneys for each serving. Split kidney, remove membrane and tubes, and soak in salted water 20 minutes. Drain and dry; dip in melted butter. Preheat broiling oven 5 minutes. Arrange alternate pieces of kidney and 1-inch squares of bacon on metal skewers, and broil 3 inches from the heat about 15 minutes, turning occasionally.

Pan-broiled Liver

Calf's liver is generally used for the invalid's tray because it is both tender and delicate in flavor. Liver from beef, lamb or pig, which is less expensive, is also very good when properly cooked.

Procedure: Have liver sliced ½ inch thick. Wipe with cloth and remove skin and tubes if this has not already been done at the store. Dredge with seasoned flour. Cook in hot, well-greased frying pan about 5 minutes, turning occasionally until well browned. Add more fat as needed. Bacon fat or butter is used generally for cooking liver. Care should be taken not to overcook liver, for long cooking will make it tough. Allow ¼ lb. for 1 serving.

Broiled Sweetbreads

Procedure: Wash sweetbreads, cover with boiling water, add 1 teaspoon vinegar and ¼ teaspoon salt. Bring to boiling point, cover and simmer over low heat 15 minutes. Drain, plunge in cold water, drain again and remove membrane and veins. Drain and dry. Preheat broiling oven and grease rack. Brush sweetbreads with melted butter or salad oil and sprinkle with salt and pepper. Broil 3 inches below the heat about 10 minutes, turning occasionally. Serve with melted butter flavored with lemon juice. Allow 1 sweetbread for 1 serving.

Creamed Sweetbreads

Ingredients:
- ½ boiled sweetbread
- 1 tablespoon butter
- 1 tablespoon flour
- ½ teaspoon salt
- Pepper

½ cup milk
¼ cup cream
1 teaspoon lemon juice
1 tablespoon minced parsley

Procedure: Prepare and boil sweetbread according to directions in preceding recipe; cut sweetbread into small pieces. Melt butter, stir in flour, salt and pepper; when blended stir in milk and cream gradually and continue stirring over low heat until sauce thickens and boils. Add lemon juice and parsley. Add sweetbread, reheat and serve on hot toast or in a croustade. Yield: 1 serving.

Creamed Dried Beef

Ingredients:
1 tablespoon butter
¼ cup shredded dried beef
2 teaspoons flour
¾ cup milk

Procedure: Melt butter in a small frying pan, add beef and cook until light brown. Sprinkle with flour and blend. Add milk gradually, stirring constantly over low heat until mixture thickens and boils. Serve on toast or on hot biscuits as desired. Yield: 1 serving.

Baked Hamburg

Ingredients:
¼ lb. ground beef
Dash salt
Dash pepper
Dash mustard
1 small onion, sliced
Melted butter

Procedure: Mix beef with salt, pepper and mustard. Form into flat cake, place in greased baking pan, top meat with overlapping onion slices and brush with butter. Bake about 10 minutes in moderately hot oven (400° F.). Yield: 1 serving.

Scraped Beef

Procedure: Take a piece of round steak, scrape with tablespoon to free from the connective tissue, season with salt and serve as desired. It may be spread between slices of bread and served as a toasted sandwich, or it may be formed into a ball and pan-broiled slightly.

Meat Stews

For meat stews and other family-size meat recipes see Chapter 49.

CHOICE AND PREPARATION OF POULTRY

The term "poultry" is used to describe domestic birds such as chicken, squab, turkey, guinea hen, goose and duck; and game such as quail, partridge and pheasant. Chicken is used more than any other form of poultry in the invalid's diet. Squab may be selected because one squab provides only one portion. Baby chickens, which are known as squab chickens, and partridge also have this advantage. A small broiler may be chosen, especially for the patient. One-half may be cooked and the rest reserved for use a day or two later. The nurse may be called upon to roast squab, baby chicken or partridge, or to prepare a broiler.

As it is now possible in many markets to buy any portion of chicken desired, this is helpful when meat is being reintroduced into the diet and when white meat of chicken has been specified by the physician. It is also convenient when the convalescent patient has a special desire for some particular chicken dish.

As it may be necessary for the nurse to supervise the preparation of boiled chicken, the method of preparation is included in this chapter. When chicken or other fowl is to be served at the family table, some of the breast meat should be

reserved for the patient, unless other portions are preferred.

Poultry is generally purchased dressed and drawn. It may be ordered split for broiling or cut in pieces for frying or other purposes. If singeing is necessary, hold the bird over direct heat and turn until all the hair has disappeared. Then wash inside and out under running water. Remove pieces of red spongy lungs, remove oil sac above tail with a sharp knife and pin feathers with tweezers.

Broilers and fryers entirely ready for cooking can be purchased packaged, both fresh and frozen. The price per pound of edible meat is no more than that for other poultry which is weighed before it is completely dressed.

Proper cooking, which develops and holds the delicate flavor of the meat, is important in preparing chicken for the invalid's tray. Young chicken may be broiled or oven-cooked in a small amount of fat. Older birds may be roasted or fricasseed. A brown fricassee is often more appealing to the appetite than the white stew, which is too often made from chicken after the broth has been extracted for soup. Chicken broth is usually favored by an invalid because of its flavor. A very palatable broth may be made from the bones of roast chicken or turkey if a pressure cooker is used. Very small chickens, known as baby or squab chickens, are sometimes available. They are about the same size as squab, the term used for young pigeon. As each provides one serving, they may be used to advantage on the invalid's tray.

POULTRY RECIPES

Boiled Chicken

Procedure: Choose a 5-lb. fowl and have it disjointed at market. Wash and place in kettle with 1 quart boiling water. Add ¼ cup celery leaves or 1 stalk celery, 1 sliced onion, 1 bay leaf, 4 peppercorns and 1 tablespoon salt. Bring to boiling point, cover, and let simmer over low heat about 2 hours or until tender. The time will depend upon the age of the fowl. Let meat cool in the liquid before removing for use in salads or in creamed dishes. Use stock in sauces or soups, or as broth. Allow about ¾ lb. for 1 serving. A 5-lb. fowl gives about 3 cups diced cooked chicken.

Fricassee of Chicken

Ingredients:

1 boiled chicken
4 tablespoons butter
6 tablespoons flour
2 cups chicken stock
1 cup top milk
Salt
Pepper
2 tablespoons chopped parsley

Procedure: Follow directions for boiled chicken (see preceding recipe). Drain and reserve stock. Melt butter, add flour, stir until well blended, and add chicken stock and milk gradually. Stir constantly over low heat until sauce thickens and boils. Add more salt and pepper if necessary. Reheat chicken in sauce. Arrange on hot platter and sprinkle with parsley. Surround with hot biscuits (p. 581) or boiled rice (p. 465). Yield: 6 servings.

Creamed Chicken

Ingredients:

1 tablespoon chicken fat or butter
2 teaspoons flour
¼ teaspoon salt
Pepper
½ cup chicken stock

½ cup milk
½ cup diced cooked chicken
1 teaspoon minced parsley

Procedure: Melt butter, stir in flour and seasonings, and when well blended add chicken stock and milk slowly, stirring constantly over low heat until the mixture thickens and boils. Add chicken and parsley. Reheat and serve on hot toast or split baking powder biscuits (p. 581) or in tart shells. Garnish with strips of pimiento if desired. Yield: 1 serving.

NOTE: Chicken stock may be replaced by ¼ cup cream.

Casserole of Creamed Chicken

Procedure: Follow preceding directions for creamed chicken. Place in small, buttered baking dish, sprinkle with buttered bread crumbs or with grated cheese and bake about 15 minutes in a moderately hot oven (400° F.) until lightly brown.

Creamed Chicken with Mushrooms

Procedure: Follow preceding directions for creamed chicken, substituting ¼ cup sliced cooked or canned mushrooms for an equal amount of chicken.

Broiled Chicken

Procedure: Select broiler weighing from 2 to 2½ lbs. Have broiler split in half and joints broken at market. Wash thoroughly and dry. Preheat broiler about 10 minutes. Place half of broiler in the refrigerator for later use. Brush other half with butter or salad oil, sprinkle with salt and pepper. Place skin side down on broiler rack 3 inches below heat. Cook from 30 to 40 minutes, turning several times and basting frequently with melted fat. Serve on hot plate with extra melted butter if desired.

A broiler may be baked in the oven from 30 to 50 minutes until tender. A high temperature (500° F.) should be used for the first 15 minutes, then reduced to moderate (375° F.). It should be basted occasionally with fat which accumulates at bottom of the pan. One serving: ¾ to 1 lb.

Fried Chicken

Procedure: Have chicken cut into pieces for serving. Wipe with damp cloth and sprinkle with salt and pepper. Dredge liberally with flour and rub flour into flesh. Dredge again, continue rubbing until no more flour can be absorbed. Fry in hot fat, which should be at least ½ inch in depth in frying pan. Lard or vegetable shortening is used generally. Turn chicken constantly until golden brown. When tested with fork, the juice should be colorless. If chicken is not tender by the time it is brown, cover and remove from heat and let stand ½ hour to finish cooking by retained heat. Serve with cream gravy if desired. To make cream gravy follow directions for cream sauce (p. 547), substituting some of the fat in which the chicken has been cooked for the butter. Allow ¾ lb. for 1 serving.

Roast Squab

Procedure: Clean squab, rub lightly inside and out with butter, and sprinkle with salt and pepper. Place breast side up in uncovered pan and roast in a very hot oven (500° F.) for 5 minutes until brown. Turn breast side down, reduce heat to slow (325° F.) and continue roasting about 20 minutes (until meat is tender). Serve with currant jelly.

Squab may be stuffed with well-seasoned buttered bread crumbs. Salt, pepper, minced onion and celery may be used to season the stuffing. Allow 1 cup soft bread crumbs for stuffing.

Roast Baby Chicken

Procedure: Follow preceding directions for roast squab.

Roast Partridge

Procedure: Follow directions for roast squab (above).

Chicken Livers

Procedure: Chickens livers may be sautéed 2 or 3 minutes in butter or may be halved, dipped in melted butter or salad oil and placed on skewer for broiling under a moderate heat for about 2 minutes on each side.

BROTHS, SOUPS AND JUICES

Meat soups, broths and juices are valued more because of the way in which they stimulate appetite than because of the very small amount of food value they contribute. Often they can be taken by a patient when there are digestive disturbances which make it difficult to tolerate other liquids. Canned consommé may be used, but there may be occasions when it is necessary for the nurse to prepare soup stock or meat juice.

To Serve Soup. Bouillon cups or cream soup dishes rather than soup plates should be used on the invalid's tray. They should be heated before soup is served. Covered soup bowls should be used when available, otherwise a saucer may be placed over the cup or cream soup dish in which the soup is served. The dish should be placed on a plate, and if any soup is spilled on the way from the kitchen to the bedroom the plate should be wiped or removed before the soup is offered the patient.

Hot crackers or Melba toast should be served separately on a small plate. Croutons may be placed in the soup just before it is to be served.

Clear Soups

Meat stock is the foundation for soups variously known as consommé, bouillon and broth. There is no clear distinction among them. The first two are generally made from fresh meat and bone purchased for the purpose of making soup stock. The less tender cuts of meats with the bones are chosen, both because they have more flavor and are less expensive than more tender meat. Beef is selected for brown stock, and all or part is generally seared until well browned before water and seasonings are added. For white stock, unbrowned chicken and veal are used. If a pressure cooker is available, soup stock (broth) can be made quickly. The directions which come with the cooker should be followed exactly.

The bones from leftover cooked meat will also make an acceptable stock, though sometimes with a little less flavor. Often the carcass of a chicken or a turkey is used for broth. If strong soup is desired, water should be added sparingly. If a pressure cooker is available, more flavor can be extracted from the meat or the bones, whether previously cooked or uncooked. The gelatin content of the bones is also more easily extracted. A soup which will jelly in the refrigerator after having been strained is generally a soup of strong flavor. The addition of vegetables and herbs to the stock pot improves flavor. A clear jellied soup stock may be served cold or may be heated until the jelly melts and the soup is thoroughly hot.

A clear soup should be strained carefully after the cooking of the

Fig. 107. Jellied consommé is refreshing on a warm day.

stock has been completed, and if it is to be clarified completely a special procedure is necessary. The consensus is that a strong homemade soup will be appetizing enough in appearance to allow the omission of final clarifying.

The skimming of soup stock should be done carefully after the strained stock has been chilled in the refrigerator. The fat will rise to the top and form a hard layer which can be removed easily. A soup upon which fat globules float may create a prejudice against soups as a class.

Clear Soup Base. A clear soup base is used as a foundation for a vegetable soup. Rice or barley is sometimes added with the vegetables and will provide additional food value. Noodles may be cooked in the clear stock and are generally served without the addition of vegetables.

Brown Soup Stock (Broth)

Ingredients:

- 2 lbs. lean beef, with bone
- 6 cups cold water
- ½ teaspoon salt
- 3 peppercorns
- 3 cloves
- 2 tablespoons each chopped onion, carrot, celery
- 1 sprig parsley

Procedure: Cut meat in 1-inch pieces and brown half in its own fat or in extra fat until seared on all sides. Crack bones and add to cooked meat. Add remaining meat and other ingredients. Bring slowly to boiling point, cover and let simmer 3 hours. Strain, cool quickly and remove layer of fat which forms on the top as stock cools. Yield: Approximately 1 quart.

NOTE: If pressure cooker is used, reduce water to 4 cups.

White Soup Stock (Broth)

Procedure: Make according to preceding directions for brown soup stock, substituting 1 knuckle of veal for beef. Make stock without browning any portion of the meat.

Consommé (Bouillon)

Procedure: Mix 1 unbeaten egg white and 1 crushed eggshell with 2 tablespoons cold water and add to 1 quart strained skimmed brown or white soup stock (broth). Stir over low heat until stock boils. Remove from heat, add ¼ cup cold water and cool. Then strain through two thicknesses of cold wet cheesecloth.

Jellied Consommé (Bouillon)

Ingredients:

- 1 tablespoon unflavored gelatin
- 2 tablespoons cold water
- ¾ cup well-seasoned soup stock or canned consommé
- 1 tablespoon lemon juice
- 1 slice or ¼ lemon
- 1 teaspoon minced parsley

Procedure: Soften gelatin in cold water and dissolve in hot stock or consommé. Place in bouillon cup and chill in refrigerator several hours (until set). If desired, break up lightly with fork. Garnish with sliced lemon and minced parsley or with cooked or canned small mushrooms.

Jellied Tomato Bouillon

Procedure: Follow directions for jellied consommé, substituting well-seasoned tomato juice for the soup stock or consommé.

Jellied Madrilene

Procedure: Follow directions for jellied consommé, using equal parts of soup stock or consommé and well-seasoned tomato juice.

NOTE: Jellied Madrilene can be purchased in canned form. The can should be chilled in the refrigerator before it is opened. It should be beaten lightly with a fork before being served in bouillon cup.

Vegetable Soup

Procedure: Diced cooked vegetables, canned or fresh tomatoes, boiled rice or barley, cooked noodles or vermicelli may be added to any type of stock. Allow ¼ cup of any one of these products or in combination to 1 cup stock. If fat is allowed in the diet, diced raw vegetables such as carrots, potatoes, turnips and minced onion may be cooked 2 minutes in a small amount of butter before the addition of stock. The saucepan should be covered and the soup cooked until the vegetables are tender. Canned consommé, bouillon cubes or instant broth dissolved in water may replace stock.

Chicken Broth

Procedure: If chicken broth is to be made in the household, plans for the use of boiled chicken (p. 520) should be made. If chicken fricassee is to be served on the family table, some of the stock from the boiled chicken which forms its base may be reserved for use on the invalid's tray. The stock should be chilled, then skimmed so as to be free of fat before it is reheated for the patient.

Beef Juice

Ingredients:

½ lb. lean beef
Salt

Procedure: Broil beef (about 4 inches square and 1 inch thick) on both sides. Two minutes should be sufficient.

Lay beef on a plate, sprinkle with salt, cut in pieces, place in meat press or potato ricer and squeeze out all the juice. Yield: About 2 ounces or 4 tablespoons juice.

Sufficient juice for two servings is generally prepared at one time. To warm the second portion, place the juice in a cup, set cup in boiling water, stir juice constantly until it is a little more than lukewarm and serve at once.

Beef Tea

Ingredients:

1 lb. chopped lean beef
1 pint cold water
½ teaspoon salt

Procedure: Place finely chopped or ground beef in a fruit jar. Add cold water and allow to stand 1 hour. Place jar in a saucepan of cold water with a cloth on the bottom of pan under the glass and heat the water over low heat. Be careful not to let it boil. Keep below boiling for 2 hours. Then slowly increase heat sufficiently to turn the beef tea a deep chocolate color. Strain and add salt. Never allow beef tea to boil, either in making or in reheating. Yield: 2 servings.

Liver Juice

Procedure: Score raw liver and sear on both sides over high heat. Place seared liver in a square made of gauze and squeeze out juice. There should be about ⅙ cup of juice from 1 pound liver. Season if desired. Yield: 1 serving.

Liver Soup

Ingredients:

3 oz. liver
1 cup broth or tomato juice
Salt

Procedure: Scrape liver. Add to clear broth with fat removed or to tomato juice. Simmer 5 minutes. Season with salt and onion juice or celery salt to taste. Yield: 1 serving.

(For soups other than those made from meat, see Chap. 47.)

STUDY QUESTIONS

1. Discuss the change in trend in meat consumption in the United States.

2. Why must meat be handled carefully in its preparation for market and also in the home kitchen?

3. Give the reasons why meat is considered to be a valuable part of the diet. State why liver and other organs have a particularly high rating.

4. Discuss the digestibility of meat. Why is the white meat of chicken often served early in convalescence?

5. Outline the principles of meat cooking. Why should particular precautions be used in cooking pork?

6. Compare the vitamin values of raw and cooked meats.

7. What is the value of meat soups, broths and juices?

CHAPTER FORTY-FOUR

Fish, Including Shellfish

FOOD VALUE
SHELLFISH
OTHER FOODS GROUPED WITH FISH
DIGESTIBILITY
PLACE IN THE MENU
SELECTION AND CARE OF FISH
FISH REICPES
SELECTION AND CARE OF SHELLFISH
SHELLFISH RECIPES

Fish and meat compare well in the chief nutritive constituent protein. Fish, however, has fewer extractives, which are responsible for the characteristic flavors of meat. While various types of fish have a certain individuality of flavor, except in the case of shellfish, they do not differ in this respect as much as does the flesh of different animals. Varieties of fish not ordinarily used are now being introduced to the markets and a definite effort is being made to stimulate production and use of both salt-water and fresh-water fish. Modern methods of quick freezing are making it possible for communities far from sources of production to have a regular distribution of good-quality fresh fish. Canned fish, such as salmon and tuna, canned shrimp and, to some extent, crab, lobster and South African rock lobster tails are also largely used. There is also some demand for salted and smoked fish.

FOOD VALUE

Weight for weight, fish is not generally so high in calories as meat, because of the lower fat and the higher water content. Fish is rich in gelatin, which is soluble in hot water. For this reason more of the nutritive value is lost in boiling fish than in baking or broiling.

As will be seen in Table 1, Part Four, there is little difference in the protein content of the various fish. There is a great difference, however, in the fat content, which varies from less than 1 per cent to more than 12 per cent. This factor has led to the classification of fish under two heads: fish low in fat and fish high in fat. The amount of fat in all fish varies somewhat with the season of the year, with the time of spawning and with changes in feeding conditions. It may be noted that certain fish which have very little fat in the edible portion have a comparatively large amount in the liver. Fish liver furnishes oil which is high in both vitamins A and D. Cod and halibut are commonly used, but mackerel, tuna, swordfish and several other species yield liver oils which are more potent.

Salt-water fish are valuable be-

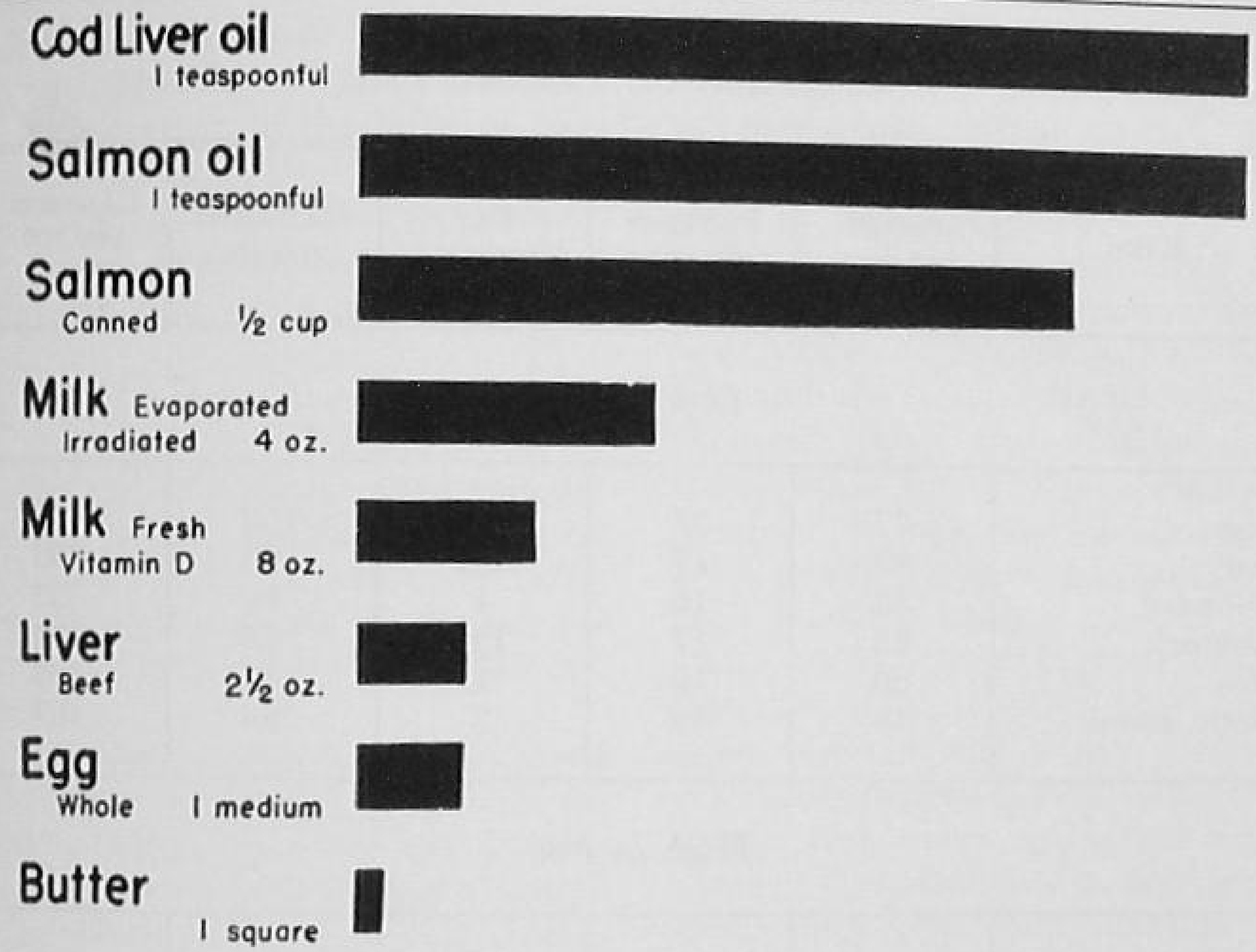


FIG. 108. Sources of vitamin D. Fish is the richest natural source of vitamin D. (Philadelphia Child Health Society)

cause of their iodine content. The phosphorus and the calcium which they contain are about equal to those of meat, but the iron content is lower.

Fish eggs, which are known as roe, are used to some extent as food and are counted a delicacy. Of these, shad roe may be obtained in both fresh and canned form. The roe of the sturgeon, which is known as caviar, is obtainable in salted form. So-called fresh caviar is mildly salted and packed in tin or in glass. It is much more expensive than the caviar which is more highly salted, packed in barrels for export and later canned. Caviar, which was once a common product in the United States before the American sturgeon was practically exterminated, is now imported from Russia. A small amount of inexpensive white-fish caviar is produced in the United States. In contrast with shad roe, which is used as a main dish, caviar is used merely as an appetizer and seldom has a place in the diet of an invalid.

Shellfish may be divided into two classes: mollusks and crustaceans. Mollusks include oysters, clams, mussels and scallops; crustaceans include lobsters, crabs and shrimps.

Like other seafoods, these are all valuable for their protein content, although they vary in the percentage composition, as will be seen by consulting the several tables which follow. Most shellfish are high in

Composition of Typical Fish

Kind	Water per cent	Protein per cent	Fat per cent	Calories per lb.	Calories per 100 Gm.
Low in Fat					
Bass	77	21	2	102	463
Cod	83	17	Tr.	68	309
Flounder	83	15	1	69	322
Haddock	82	17	Tr.	68	309
Pike	80	19	1	85	386
Trout, brook	78	19	2	94	427
High in Fat					
Bonito	68	24	7	159	722
Herring	73	19	7	139	631
Mackerel	68	19	12	184	835
Salmon, Pacific	63	17	17	221	1,003
Shad	70	19	10	166	754
White Fish	70	23	7	155	704

Proximate Composition of Shellfish

Description	Water per cent	Protein per cent	Fat per cent	Carbohydrate per cent	Calories per Lb.	Calories per 100 Gm.
Clams, long and round	80	14	2	2	82	372
Crabs	80	16	2	1	86	390
Lobsters	79	16	2	1	86	390
Mussels	77	14	2	5	94	427
Oysters	80	10	2	6	82	372
Scallops	80	15	Tr.	3	72	327
Shrimps	78	18	1	1	85	386

minerals; as a class they constitute a very valuable source of iodine.

By reference to the table of composition of shellfish, it will be noted that they are all of approximately the same composition. As a class, they are high in protein and low in fat.

Oysters

Oysters are among the most important of the shellfish, as they are often used in the invalid's diet. They are grown abundantly in shallow salt water along the shores of the United States.

The usual season for oysters opens the first of September and closes the first of May. They are not a desirable article of food during the summer, which is the spawning season. This season varies in different localities, but covers a period of from four to six weeks. After harvesting, oysters should be kept alive until required for use.

Among the best-known varieties are blue points, lynnhavens, rockaways, saddle rocks, shrewsburys, etc. Such names formerly indicated the locality in which the oysters were grown, but this no longer holds, the name generally denoting merely the size of the oyster. For example, the name blue point is now given commonly to oysters not exceeding 2 or 2½ inches in length.

Oysters are valued especially for their iron, copper and iodine content. They also contribute some calcium, phosphorus, vitamins A and C, and comparatively larger amounts of the vitamins of the B complex. As the caloric value is low, oysters are used in the general diet, particularly on account of their flavor and their digestibility. Raw oysters rank first on this count. When cooked, the cooking period should always be short to avoid toughness.

Oysters may be contaminated by water polluted by sewage. Oyster beds which supply commercial distributors are located in safe waters. Shucked oysters may become contaminated in the process of shelling, because of improper handling. A much greater number of bacteria has been found in shelled than in unshelled oysters. Since organisms have been found in oysters, after even eight weeks of cold storage, cooking is a necessary precaution, unless the oyster beds are supervised and examined regularly, as is customary under the laws of a number of coastal states which supply most of this popular shellfish.

Oysters in the shell may be served raw, broiled or baked, and out of the shell stewed, creamed, scalloped, fried and roasted. In choosing oysters those with tightly closed shells should be selected. The oysters should have a good odor, should not be ropy or slimy, and should not be "bloated" by placing them in fresh water.

Clams

Clams rank next to oysters in popularity. They are of two kinds, hard and soft shell. They are found just below the surface of sand and mud at low tide and are dug with shovel and rake. The long soft-shelled clams are found abundantly on the New England coast. The round hard-shelled clams, called quahaugs, are found from New York

to Florida. The very small round clam is known as the little neck.

Clams are most abundant during the closed oyster season. Little-neck clams are served raw and often take the place of blue points on hotel and restaurant menus. They do not differ much from oysters in food value. Clams are lower in minerals and vitamins than oysters.

Quahaugs, or large clams, are used for chowder, broth and frying. Soft-shelled clams are boiled, steamed and used in chowders. In choosing clams, those with unbroken shells should be selected. If open, they should close quickly when touched and have a good odor. The sanitary precautions given for oysters should apply to clams, mussels and scallops.

Mussels

Mussels are not generally used for food in the United States, but are used extensively in France, Holland and England. They are found in both fresh and salt water.

Scallops

Scallops, like oysters, are bivalves, but only the muscle which opens and closes the shell is used for food. Two types of scallops are found in the waters of the Atlantic and the Gulf of Mexico. Those which are found in shallow waters are smaller and more tender than the deep-sea scallops. Scallops are sold by the quart or pound and may be broiled, fried, baked or used for chowder. They have a comparatively high mineral and vitamin content.

Lobsters

Lobsters are salt-water crustaceans and are found in Atlantic waters from Newfoundland to New Jersey. They are most plentiful in summer. Lobsters have a dark-greenish hard shell which turns red during cooking.

Live lobsters heavy for their size should be chosen. There should be an active, quick response to touch. After boiling, the tail should spring back when straightened out. This test shows that the lobster was alive before cooking. Lobsters may be served boiled, baked, creamed or broiled.

Large crawfish are sometimes called lobster. The flavor is not unlike that of lobster. Frozen South African rock lobster tails are now in rather general distribution in our markets. As the fish are taken from the very cold antarctic current, trimmed and fast-frozen immediately, the quality of the meat is very good and suitable for boiling and broiling. The tails range in size from 4 to 16 ounces.

Crabs

Several types of crabs are found along the Atlantic and the Pacific coasts. Soft-shelled crabs are small Atlantic crabs which have shed their shells. They are usually cooked whole. The meat of the hard-shelled crab is usually picked after boiling and shipped packed in ice or canned. Most of the canned crabmeat comes from the large crabs of the Pacific Ocean, although some is now coming from Atlantic waters. Crabmeat supplies a fair amount of minerals and vitamins.

Shrimps

Shrimps from Southern waters, which are used commonly, actually belong to the prawn family. True shrimps are found to some extent along both the Atlantic and the Pacific coasts. A large amount of the tail meat of the Southern shrimp is canned and furnishes the principal supply. In this form shrimp is used for salads, cocktails and luncheon dishes. Shrimps rank next to oysters in mineral content and supply some vitamins.

Shrimp is perhaps the most popular shellfish, as it lends itself well to canning which has made possible its wide distribution. Fresh shrimp is boiled before or after shelling and may be served in or out of the shell.

OTHER FOODS GROUPED WITH FISH

Turtles. Both fresh- and salt-water turtles are used. The green turtles grow to an enormous size, some weighing from 50 to 100 pounds. They are used principally for making soups, some of the flesh being included in the soup. No work has been done on the vitamin or mineral content.

Terrapins. Terrapins are found in fresh and salt water and are shipped from the South packed in seaweed. They are in season from November to April. Like the lobster, they are cooked alive. Because of the scarcity of terrapin and the increased cost (from two to seven dollars each), they are used very little. The diamond-back terrapin is the most famous variety. Only the female is used for food, the choicest or "full cow" terrapin containing eggs. Terrapin is prized for its delicate flavor rather than for its food value.

Frogs' Legs. Frogs' legs are utilized in some parts of the United States, only the hind legs being eaten. They are easily digested and have a very delicate flavor, much like the white meat of chicken. They are served broiled or fried.

DIGESTIBILITY

Fish, in general, is easily digested because of its short and tender muscle fibers. The controlling factor of digestibility as far as fish flesh is concerned is its fat content; in the richer varieties the fat delays food passage through the stomach, which may be an important consideration in some dietary conditions. If fish low in fat is desirable, charts of "approximate composition" may be consulted. The method of preparation may also be a factor in digestibility, especially when fat is not well tolerated.

Shellfish vary greatly in the rapidity with which they are digested. Oysters are among the most valued foods for the invalid because they digest easily. Lobster is seldom used in the invalid diet because of the coarseness of the meat and the strong flavor. Other shellfish are usually well tolerated, although there may be allergies toward one or more of the members of the shellfish family and occasionally to other types of fish as well.

PLACE IN THE MENU

Fish and shellfish may be used to advantage in the invalid's diet if the patient likes this type of food. The texture of fish is so tender that it may be introduced as soon as solid food is allowed. Fish such as salmon and shad, whose flesh contains fat, is sometimes reserved for later use. Oysters are used more than any other shellfish, although clams, crabmeat and shrimp will offer a desirable variety during the latter part of convalescence. Lobster may have a place on a tray prepared for a convalescent patient under no dietary restrictions.

SELECTION AND CARE OF FISH

Fish is offered on the market today in a number of different forms. Coastal cities and regions bordering on the Great Lakes are well supplied with fresh fish, which is carefully packed in ice for distribution. Fish frozen quickly near its source is kept in cold storage until there is a demand for it. In addition, fish fillets packed in cartons before freezing are available in many markets. Frozen fish should not be defrosted until just before it is to be used. When this is done at market, the test for frozen, as well as for fresh, fish should be firm flesh and lack of a strong odor. Fish should be stored in a covered utensil in the refrigerator. When frozen fish is bought in cartons of family size, it should be allowed to thaw on the shelf of the refrigerator or at room temperature for a number of hours, then cooked promptly. Cartons which arrive in the home kitchen frozen hard may be stored in the freezing unit of the refrigerator to remain until required. Canned fish should be stored in a dry, cool place, and the cans should not be opened until just before the fish is to be used. Quantities of fish are still prepared for shipping by the oldest methods of food preservation—drying, smoking, salting and pickling. By such methods fish will keep in good condition a long time. Fish so treated is generally purchased just before it is to be used, although it may be kept at home when good storage conditions are available.

FISH RECIPES

The general rule for cooking fish may be summed up in one sentence: Short cooking just before serving is most important. This rule is particularly applicable in the case of broiled and pan-broiled fish, which after cooking dries out quickly. The test for cooking is simple. When tried with a fork, the flesh should flake. Sliced or quartered lemon is the chosen garnish for fish for both appearance and flavor. If a sauce is used, it should be flavored either with lemon or some other pungent ingredient.

Fish, Baked Fillets

Procedure: Wash fish fillet and wipe with cloth. Dip in milk, sprinkle with salt and roll in fine, dry bread crumbs or rolled cornflakes. Place in a small, greased baking pan, sprinkle with melted butter or salad oil and bake in a very hot oven (500° F.) 10 minutes or until well browned. Serve with tartare sauce in a lettuce cup, if desired, and lemon quarter.

To make tartare sauce: Mix 1 teaspoon finely minced olives or pickles and a few drops onion juice with 1 tablespoon mayonnaise.

Broiled Fish

Procedure: Wash fish thoroughly, wipe with cloth. Brush with melted butter or salad oil, sprinkle with salt and pepper. Place skin side down on well-greased broiler rack, broil 2 inches from heat from 10 to 15 minutes (until brown). The flesh should flake when tried with a fork. Serve with melted butter and sliced lemon. Allow 1 small fish or ⅓ lb. fish fillet for each serving.

Pan-broiled Fish

Procedure: Wash fish thoroughly and wipe with cloth. Roll in seasoned flour, corn meal or fine dry crumbs. Melt 1 tablespoon butter or bacon fat in a small heavy frying pan and sauté fish over moderate heat until brown on one side. Turn with a pancake turner and brown the other side. Allow from 8 to 10 minutes for cooking. Dress with melted butter or minced parsley.

Poached Fish (Boiled Fish)

Ingredients:

- 1 teaspoon butter
- 1 teaspoon chopped celery
- 1 teaspoon chopped carrot
- 1 sliced onion
- 1 peppercorn
- ⅛ teaspoon salt
- 1 teaspoon vinegar
- 2 cups water
- ⅓ pound fish fillet

Procedure: Melt butter, add vegetables and cook ½ minute. Add seasonings, vinegar and water. Cover and bring to boiling point. Boil 5 minutes. Wash fish, tie in cheesecloth, place in water and let simmer from 20 to 30 minutes, until fish flakes when tried with a fork. Remove from cheesecloth and drain. Serve with egg, cheese or hollandaise sauce (see Sauces for Vegetables, p. 547) or chill and flake for use in recipes for creamed or scalloped fish (see below). Yield: 1 generous serving.

Egg Sauce for Fish

Ingredients:

- 1 tablespoon butter or margarine
- 1 tablespoon flour
- ⅓ cup fish stock
- ⅓ cup sweet or sour cream
- 2 teaspoons lemon juice
- ½ hard-cooked egg
- 1 teaspoon minced parsley

Procedure: Melt butter or margarine in small saucepan, stir in flour. When well blended, stir in the stock. Continue stirring over low heat until mixture thickens slightly. Add cream and stir until sauce boils. Add lemon juice and hard-cooked egg white cut into pieces. Add salt, if needed. Reheat and pour over poached fish fillet. Sprinkle with sieved hard-cooked egg yolk and minced parsley.

NOTE: Milk may replace the cream if a less rich sauce is desired.

Creamed Fish

Ingredients:

- 1½ tablespoons butter
- 1½ tablespoons flour
- ¼ teaspoon salt
- Pepper
- ¾ cup top milk
- ½ cup flaked fish
- Nutmeg
- 1 tablespoon minced parsley or chives

Procedure: Leftover cooked fish or canned tuna fish, salmon, crabmeat or shrimp may be used. Melt butter, stir in flour, salt and pepper. When well blended, add milk slowly, stirring constantly over low heat until the mixture thickens and boils. Add fish, nutmeg and more salt if necessary. One teaspoon lemon juice may be added if desired. Reheat, serve on toast or in patty shell. Sprinkle with minced parsley or chives. Yield: 2 servings.

Creamed Fish with Mushrooms

Procedure: Follow directions for creamed fish (see above), adding 2 tablespoons sliced cooked or canned mushrooms with the fish.

Codfish, Creamed

Ingredients:

⅛ cup salt codfish
⅓ cup cream sauce (p. 547)

Procedure: Soak codfish in cold water 20 minutes to remove some of the salt; drain. Cut in small pieces and combine with cream sauce, from which salt has been omitted, and heat thoroughly. Yield: 1 serving.

Scalloped Fish

Ingredients:

2 tablespoons butter
1 cup soft bread crumbs
¼ teaspoon salt
Pepper
2 teaspoons lemon juice
⅔ cup flaked cooked or canned fish

Procedure: Leftover cooked fish or drained canned tuna fish or salmon may be used. Melt butter, add crumbs and stir with a fork until well mixed. Add salt, pepper and lemon juice. Arrange fish and crumbs in alternate layers in a small, greased baking dish. Bake about 5 minutes in a hot oven (450° F.) until crumbs are golden brown. Yield: 2 servings.

SELECTION AND CARE OF SHELLFISH

Great care must be taken in the handling and the preparation of shellfish for shipment. Lobsters, oysters and clams in the shell are packed in ice and shipped alive to market points. South African rock lobster tails are fast frozen for shipment to distant points. Shucked oysters are packed in metal containers or waxed cartons which should be refrigerated or surrounded with ice. Shucked oysters are also quick frozen after packing in cartons. They should not be thawed until ready to use. Both soft- and hard-shell crabs are shipped alive, but the majority of the meat from the latter is boiled, picked, placed in cans and packed in ice for shipment. Scallops are usually sold in fresh form, although a few are now frozen. All shellfish after purchase should be stored in the refrigerator and used within 24 hours.

SHELLFISH RECIPES

Creamed Oysters

Ingredients:

1½ tablespoons butter
1½ tablespoons flour
¼ teaspoon salt
Pepper
½ cup milk
6 oysters
1 tablespoon diced raw celery

Procedure: Melt butter in a small saucepan, stir in flour, salt and pepper; stir in milk gradually and continue stirring over low heat until sauce thickens and boils. Add drained oysters and celery and cook over low heat about 2 minutes until edges of the oysters curl. Serve on hot toast or in patty shell; garnish with strips of pimiento or minced parsley. Yield: 1 serving.

Panned Oysters

Ingredients:

6 oysters
½ tablespoon butter
Salt
Pepper

Procedure: Drain the oysters, pour into hot dry saucepan and cook, stirring constantly until edges curl. Add butter and seasoning. Serve on toast. Yield: 1 serving.

Scalloped Oysters

Procedure: Follow directions for scalloped fish (on this page), substituting 6 raw oysters for the flaked fish.

Baked Oysters Casino

Ingredients:

- 6 oysters, in shells
- 1 tablespoon finely minced green pepper
- 1 strip bacon, finely minced
- ½ tablespoon lemon juice
- Dash pepper

Procedure: Have raw oysters opened at market. Arrange on half shells on pie plate. Sprinkle each with minced green pepper, minced bacon, lemon juice and pepper. Bake in hot oven (450° F.) about 10 minutes (until edges of oysters curl). Yield.: 1 serving.

Clams, Steamed

Ingredients:

- 1 pint clams
- ½ cup boiling water
- 2 tablespoons butter, melted
- 1 teaspoon lemon juice

Procedure: Scrub clams with brush and wash under running water until sand has been removed. Place in kettle with boiling water, bring to boiling, cover and cook over low heat from about 12 to 15 minutes (until shells open). Serve on a hot platter and cover with a napkin. Mix melted butter with lemon juice. Pour into small cup. Strain clam broth into a bouillon cup. Yield: 1 serving.

Scallops, Baked

Procedure: Wash and drain ¼ lb. scallops. Roll in seasoned fine dry bread crumbs. Arrange in small, greased, shallow baking dish. Sprinkle with melted butter or with 1-inch pieces cut bacon. Bake under broiler about 4 inches from moderate heat about 10 minutes.

Scallops, Scalloped

Procedure: Follow directions for scalloped fish (p. 534), substituting ½ cup whole bay scallops or ½ cup cut sea scallops for the flaked fish.

Shrimps en Brochette

Procedure: Arrange cooked shrimps alternately with 1-inch pieces bacon on metal skewer. Broil about 3 inches from heat for 5 minutes, until bacon is crisp, turning occasionally. Garnish with lemon quarter. Allow 4 or 5 shrimps for 1 serving.

South African Rock Lobster Tails

To Boil: Have ready a kettle of salted boiling water. Remove cellophane from lobster tails. Plunge tails thawed or unthawed into the water. Bring to boiling and continue boiling until meat is no longer transparent: about 1 minute for each ounce of weight should be allowed after water reboils. Drain lobster tails, drench with cold water and cut inner membrane or shell with scissors. Pull out meat with fingers. Tails may be served whole, cold or hot with a sauce, or may be diced and used for Newburg, salads or other dishes. If meat is chilled before dicing, it will cut more easily.

To Broil: Thaw lobster tails. Cut inner membrane or shell at both edges with scissors and remove. Bend tail backwards and crack shell. Place shell side up on rack of preheated broiler, 5 inches below heat. Broil 5 minutes. Turn, spread with butter or margarine and broil 6 to 9 minutes, depending upon size, until meat is tender when tried with a fork.

STUDY QUESTIONS

1. Compare fish and meat for food value and flavor.
2. Name several types of fish that could be used when necessary to keep fat intake low.
3. Which shellfish appear most commonly on the menu? Which are chosen most often for the convalescent diet, and why?
4. Give the principles for the selection and the care of fish.
5. State the principles for cooking fish.

CHAPTER FORTY-FIVE

Vegetables

BOTANICAL CLASSIFICATION
FOOD VALUE
DIGESTIBILITY
CANNED VEGETABLES
FROZEN VEGETABLES
DEHYDRATED OR DRIED VEGETABLES
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Under the term "vegetables" are grouped foods representing practically every part of edible plants, leaves, stems, seeds and seed pods, flowers, roots, tubers and fruits. The realization that vegetables had an important contribution to make to the diet spurred research work in nutrition and resulted in their being classified under four of the Seven Basic Food groups considered essential for daily use. Under Group 1 are listed all which have a characteristic green or yellow color. In Group 2, salad greens, cabbage and tomatoes are listed with citrus fruits. In the form of legumes, such as dried beans, peas and lentils are classified in Group 5 with meat and other contributors of protein. The remaining vegetables are classified in Group 3 with fruits other than citrus and tomatoes. In addition to their nutritive quality, vegetables are valued because of the variety they give to the diet through texture, flavor, odor and color. (See Chap. 2.)

BOTANICAL CLASSIFICATION

Botanically, vegetables fall into different classifications according to plant structure. However, this does not indicate in general their nutritive value.

Leafy Vegetables. The leafy vegetables—often called green vegetables—contain less than 10 per cent of solid matter. Outstanding members of the group are spinach, cabbage, Brussels sprouts, lettuce and greens of all sorts.

Stem Vegetables. Celery, asparagus, leeks and rhubarb are classed as stem vegetables, although rhubarb is generally considered a fruit because of the need of sugar in its preparation and because of the way in which it is used in the menu. Kohlrabi is a combination of stem and root.

Roots and Tubers. Vegetables which grow underground are classified as roots and tubers. Of these, beets, carrots, salsify, turnips, sweet

potatoes and parsnips are true roots. While potatoes, Jerusalem artichokes and peanuts, the last used almost entirely as nuts, are tubers or underground stems. Onions are actually bulbs.

Flower Vegetables. Cauliflower and broccoli are examples of the flower type of vegetable. The tips of asparagus are flower buds. Brussels sprouts might be classified as a flower or as a leafy vegetable.

Fruits Classed as Vegetables. Vegetables which are essentially the fruits of the plants are tomatoes, peppers, cucumbers, squashes, pumpkins and eggplants.

Seeds and Seed Pods (Legumes). Peas, beans and lentils are classified as legumes. All are found in seed form, encased in pods. Both pods and seeds of young beans are eaten in the form of snap beans. Peas and some beans are shelled and used as green vegetables. In dried form, peas, beans and lentils are largely used and, unlike other vegetables, serve as a meat substitute on account of their high protein content. Soybeans, which are high in both protein and fat, differ from other legumes. Grains which are used for flour and other cereal products are also seeds.

Edible Fungi. The fungi are plants characterized by an entire lack of chlorophyll, the green coloring matter which enables plants to make food from the carbon dioxide of the air. The edible varieties are commonly known as mushrooms; the inedible are popularly called toadstools, especially the injurious ones, many of which are extremely poisonous. Research work in regard to the food value of cultivated mushrooms shows that they contain protein similar to the gliadin of wheat. They provide appreciable amounts of copper and iron and several fractions of the B complex.

FOOD VALUE

In general, vegetables are valued more highly for their vitamin and mineral contributions than for their other nutrients. They differ greatly, however, in these respects, as a comparison of one vegetable with another through consultation with Table No. 1, Part Four, will demonstrate. Green and yellow vegetables are the best sources of carotene, the provitamin A. First on such a list are dandelion greens, carrots, turnip greens, spinach, sweet potatoes, kale, beet greens, collards and mustard greens. Next in order come winter squash, broccoli, chard, lettuce, tomatoes, asparagus, green peas and strings beans. (See Fig. 18, Chap. 7.) White celery and peeled cucumbers are lacking in this vitamin, but Pascal celery probably will be found to be as rich as its color would indicate, and it is already known that unpared cucumbers supply vitamin A.

Vegetables in general are a more important source of ascorbic acid than has been recognized, as almost all contribute at least a small amount. The tomato is the most important source, not only because of its natural high content but because this is not destroyed by the canning process. Because tomatoes are used so much, they are more important in the meal plan than some other vegetables which are not eaten daily but

AVERAGE VITAMIN LOSSES IN THE COOKING OF VEGETABLES
(Per cent loss includes *dissolved* plus *destroyed*)

VEGETABLE TYPE	CARO-TENE	THIA-MINE	RIBO-FLAVIN	NIACIN	ASCORBIC ACID
Leafy green	20	25	25	25	45
Other green types (Broccoli, asparagus)	10	10	20	15	25
Yellow types (carrots, sweet potatoes	10	25	..	15	15
White potatoes					
boiled	..	20	25	20	20
baked	..	..	..	..	55
mashed	..	..	..	..	50
Beans and peas					
fresh or frozen	15	20	25	20	40
canned	45	40	35	..	45

which may rate higher in ascorbic-acid content. The best contributors in order of ascorbic acid content are turnip greens, green pepper, broccoli, kale, mustard greens and Brussels sprouts. Cauliflower, spinach and cabbage come next in order. Potatoes, white or sweet, while less high in vitamin C than some of the other vegetables, are used in such quantities that they add materially to the total of the day. This is also true of lettuce and other salad greens when they are used often. (See Fig. 22, Chap. 7.)

As can be seen by consulting Table 1, Part Four, and illustrations in Chapter 8, vegetables supply varying amounts of thiamine, riboflavin and niacin of the B complex group. Again, greens are high on the list as a source. Peas and potatoes also rate well. Even when amounts are small, vegetables as a class play a part in the accumulation of the daily total of the B complex.

Vitamin Loss in Cooking. The losses of vitamins in the cooking of vegetables are exceedingly variable, depending upon the type of vegetable and the method of cooking. Furthermore, available data are meager and difficult to evaluate. The percentage of loss may be reduced materially by cooking in little water only until done and by using the cooking water. To give some idea of the losses to be allowed for, even when preferred methods of cooking are used, the following general estimates have been derived from the Food and Nutrition Board[1] figures. (For the vitamin content of raw and cooked vegetables see Table 1, Part Four.)

Mineral Content. The mineral content of vegetables is significant in the diet. The calcium, the phosphorus and the iron make them as a class useful contributors to the

[1] Food and Nutrition Board, Table of Vitamin Losses in Cooking, 1944.

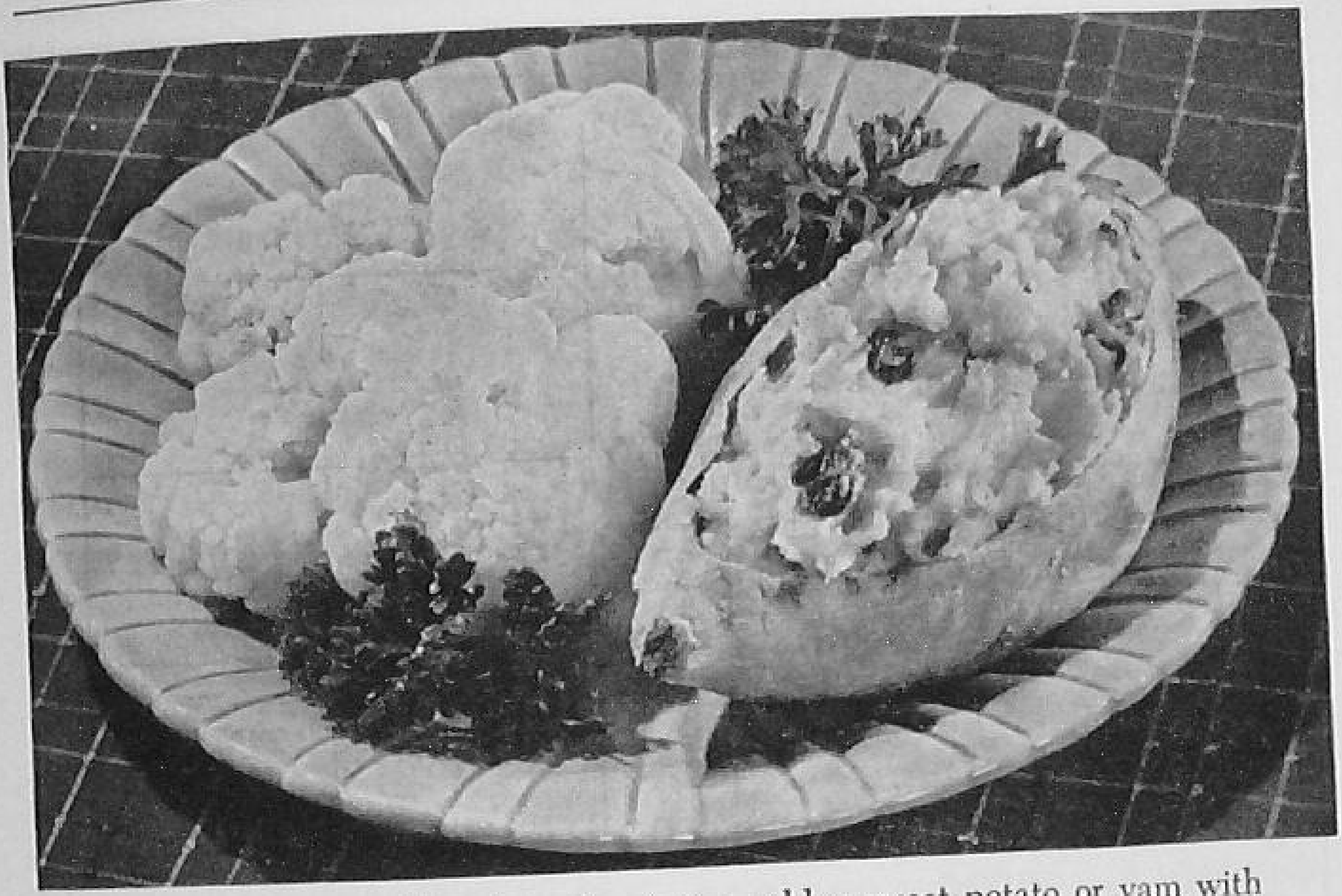

FIG. 109. A vegetable plate showing a golden sweet potato or yam with delicate white cauliflower.

specific needs of the body for these minerals. At the same time, the alkaline residue which they leave after digestion and absorption tends to balance the acid residue of meats and cereals and thus aids in maintaining the neutrality of the blood. Reference to Table 1, Part Four, will show that legumes—under which heading are included dried beans and peas and lentils—have particularly high mineral value. Of course, this will be reduced per serving after they have been soaked and cooked, but they are still good sources. Potatoes, because they are eaten so often, make a larger contribution of minerals than would appear from composition figures.

Leafy green vegetables are naturally high in mineral content, but not all of this is available. Knowledge of the availability is at present inadequate. The utilization of the calcium depends upon the amount of oxalic acid present. While greens score well in the case of iron, it may be only partially available. The mineral content may be influenced by the type of soil in which vegetables are grown. This is illustrated particularly in the case of iodine (see Chap. 7). When vegetables are cooked, there may be some loss of minerals in the cooking water. This is another reason why a minimum amount of water should be used and the vegetable liquor either served with the vegetable or used in a sauce or soup.

Protein is to be found in the dried legumes in a quantity which qualifies them as a substitute for animal protein. However, its quality is not

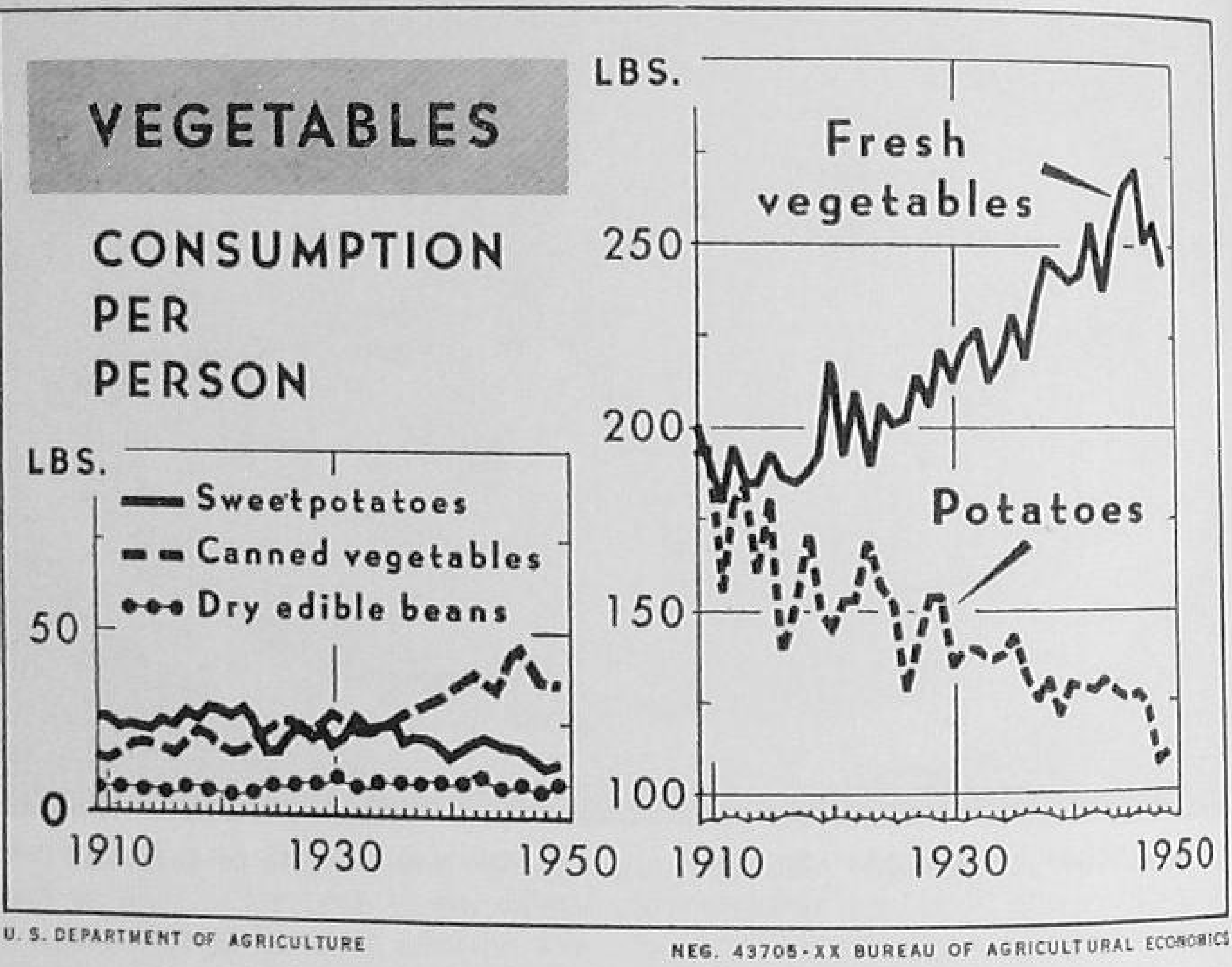

FIG. 110. The per capita consumption of fresh vegetables, including melons, has increased about one sixth since 1909, while the consumption of commercially canned vegetables more than doubled. On the other hand, per capita consumption of potatoes decreased about one third during the period 1909-1943, and sweet potato consumption declined about one fourth.

so high, and it is not so well utilized in the body. Soybeans are in a somewhat different classification, as their caloric value is chiefly in the form of protein and fat, and they are almost starch-free. The quality of the protein is good, and its comparative value is being studied further. While the percentage value of the protein in most fresh vegetables is not high, it is enough to be considered. According to Sherman,[2] ". . . they show as much or more of their total calories in form of protein as is customary or desirable in ordinary dietaries."

Caloric Value. The caloric value of vegetables is generally in ratio to water content. The range in value is from young fresh greens through potatoes to dry legumes. Except in the case of the legumes, which are comparatively high in protein as well as in carbohydrate, the caloric contribution is generally supplied by the starch content, in which potatoes are particularly high. A few vege-

[2] Sherman, H. C., and Lanford, C. S.: An Introduction to Foods and Nutrition, p. 130, New York, Macmillan, 1943.

tables, notably beets and sweet potatoes, are comparatively rich in sugar. Certain young vegetables, such as peas and corn, have carbohydrate in the form of sugar which changes to starch as the vegetables mature. Available carbohydrate, which is the sum of starch, dextrin and sugar, has been determined for many common vegetables, but data are still incomplete. The percentage of fat in vegetables is very low, except in the case of soybeans.

Almost all vegetables contain large amounts of the nondigestible forms of carbohydrate known as cellulose and hemicellulose, which are useful as bulk in aiding peristalsis. It is often of value to be able to introduce into the intestinal tract a sufficient amount of indigestible residue without unduly increasing the daily caloric intake.

Research work has shown that the food value of vegetables is dependent to some extent upon the type of soil, the methods of fertilization and the varying conditions of the season. Experiments are now being conducted with a view to improving growing methods, and it is hoped that the result eventually will be the production of vegetables higher in vitamin and mineral content than those available today. New and better methods of packing and distributing are also under study. An adequate supply of vegetables gives to the diet what is called "the factor of safety" with reference to vitamins and minerals, but with the many variable conditions affecting quality, the vegetable content of the diet must be abundant in order to be adequate.

DIGESTIBILITY

The normal person can digest vegetables easily. Tender young vegetables are often served raw as relishes or salads. To the standard list of salad vegetables, which includes greens, tomatoes, cucumbers, celery, cabbage, onions and radishes, have now been added thinly sliced carrots, green peppers, turnips and flowerets of cauliflower. However, discretion should be used in offering a convalescent patient salads and relishes of pungent flavor.

Discretion also should be shown in serving cooked vegetables, as some which can be taken under conditions of normal health may cause distress during illness.

Alvarez and Hinshaw,[3] who made a survey of foods that gave distress to their patients, found that the following vegetables were frequently reported as causing "gas, belching, flatulence or distention": onions, cabbage (and other members of the cabbage family), radishes, dried beans, cucumbers and lettuce. Others less frequently reported were melons, tomatoes, corn and peppers. Under certain conditions when roughage must be avoided, it may be necessary to serve vegetables in puréed form. The puréed vegetables designed for feeding infants will be found a convenience in this case.

CANNED VEGETABLES

Canned vegetables provide out-of-season products which contribute practically the same food value as cooked fresh vegetables. Canning factories are distributed throughout

[3] Alvarez, W. C., and Hinshaw, H. C.: J.A.M.A. **104**:2053, 1935.

the country in the center of producing districts. The products are picked as soon as they have reached the proper stage and are taken immediately to the factories, where they are cleaned, prepared and packed at once into cans or glass jars, which are then subjected to pressure heat. The scientific methods used for the preservation of perishable foods guarantee that the products will be safe and wholesome.

FROZEN VEGETABLES

Quick-frozen vegetables are now widely accepted as equal or superior in food value to fresh vegetables other than those freshly picked from the garden. Ready as they are for cooking, they have proved to be a great convenience. The distribution of commercial products has widened every year as dealers became convinced that it was worth while to purchase the refrigerated equipment necessary for their storage. In large cities, stores which deal only in frozen products are increasing in numbers. Many towns offer locker facilities where green vegetables and other products may be frozen and stored at the necessary low temperature. There is an increasing use of the home freezer for this purpose by those who raise their own products.

Frozen products, fresh and of good quality, prepared and packed properly for freezing, lose little of their natural food value during storage at the proper temperature.

DEHYDRATED OR DRIED VEGETABLES

Dehydrating by some means of drying is the oldest method of preserving vegetables. Except in the case of the legumes such as peas, beans and lentils, this process had been superseded largely by canning and freezing until war demands for conservation of space in shipment created a new interest in dehydrated products. Many research projects in the interest of preserving flavor, texture and vitamins of vegetables and some fruits were undertaken with varying success. These products were known as dehydrated foods in contrast with dried beans and peas. As with the latter, it is necessary to reconstitute them by soaking in cold water for a specified time before cooking. Demand for these naturally lessened as canned products of every variety again became available. Those on the retail market, such as onions and parsley, are generally used for seasoning purposes.

PLACE IN THE MENU

A well-rounded menu will have vegetables in some form at both mid-day and evening meals. Effort should be made to serve at least two vegetables besides potatoes, one of them in raw form as a salad or relish. In the Seven Basic Food Plan one green or yellow vegetable is suggested for daily use. When a variety of such vegetables is not available a double portion of any leafy green vegetable in salad form may be used.

PREPARATION AND COOKING

Under modern conditions of growing, shipping and distributing, almost all fresh vegetables can be found in market throughout the year, regardless of season. To supplement the fresh vegetables which

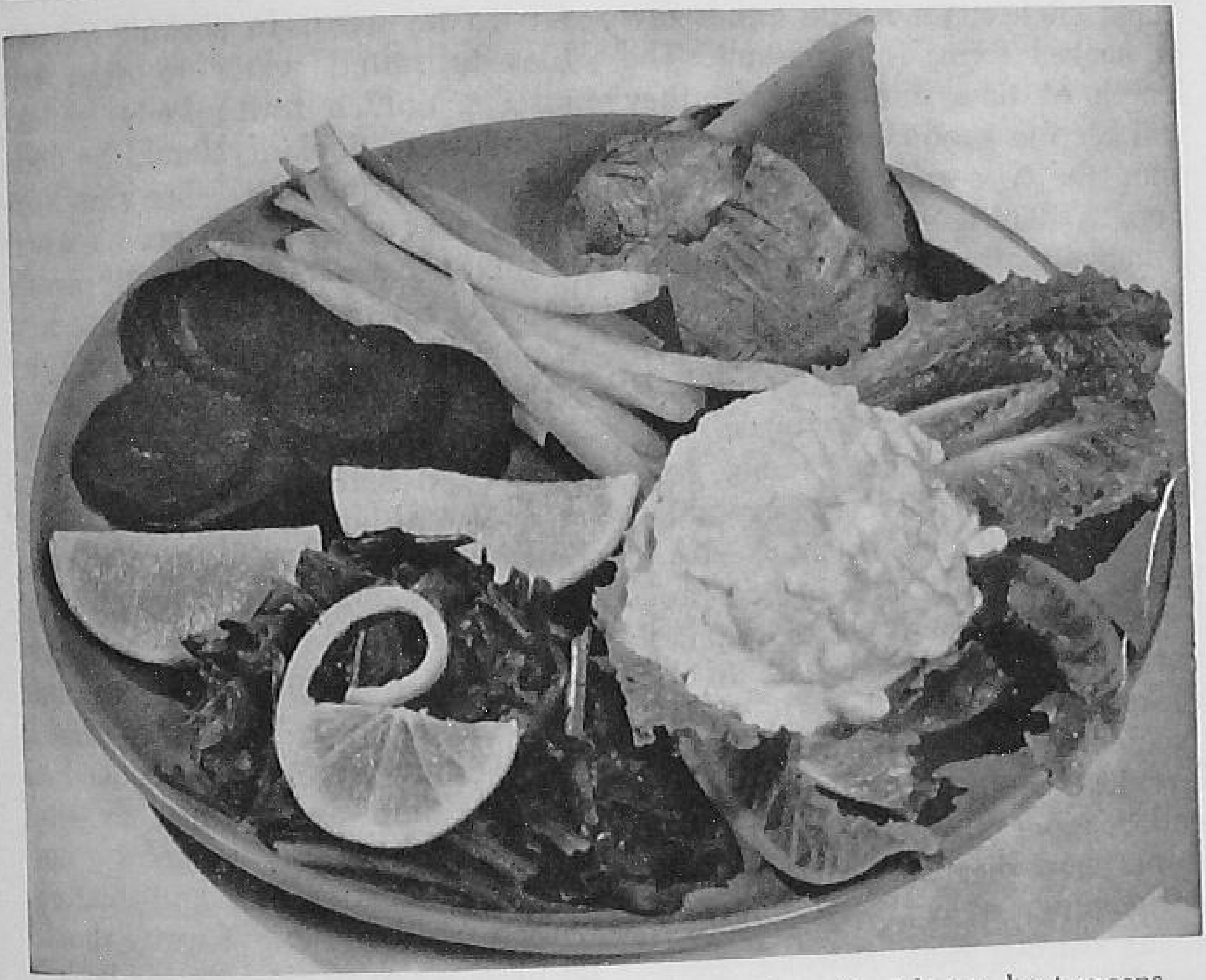

FIG. 111. A vegetable plate with baked potato, hot sliced beets, beet greens garnished with lemon, carrot strips and cottage cheese.

are shipped from the South and the Far West to markets thousands of miles away and the local products which are in season, there are as well the quick-frozen vegetables, the quality and the price of which are stable throughout the year. In addition, there is an ever-increasing variety of canned vegetables. With so much from which to choose there is no reason, except a dislike of certain products, why the menu should not be varied daily so far as vegetables are concerned.

As it may be important to introduce as many vegetables as possible, sometimes a prejudice may be overcome by persuading the patient to taste a vegetable which hitherto has been refused. If the patient has been accustomed to overcooked cabbage, for instance, he may be surprised to find that he likes that crisp light-green or creamy-white vegetable which appears on his tray. On the other hand, one badly cooked vegetable may cause the patient to lose interest in this important asset to diet.

The selection of vegetables for the invalid's tray should be made with reference to the family meals. However, it is possible to buy many vegetables in small quantities and to prepare them especially for the patient.

The care of vegetables in the

home kitchen, for use in either raw or cooked form, is important. The length of time during which they will keep in good condition depends upon the type and the facilities for storage. Root crops, such as turnips, potatoes, carrots and beets, lose their ascorbic-acid content slowly, but preferably they should be kept in a dark, dry, cool place. Large vegetables, such as cabbage, squash and pumpkin, retain their vitamin content better than the leafy vegetables and the small ones such as string beans. Vegetables such as peas and Lima beans should not be shelled until just before they are to be cooked if a large loss is to be avoided. All green vegetables show less loss under refrigeration than under room temperature. Experiments show that when stored in the refrigerator salad greens, celery, young carrots, peas, radishes, parsley, broccoli, cauliflower and tomatoes should be covered, while cucumbers, green and Lima beans, eggplant and summer squash may be left uncovered.

For detailed directions for vegetables to be served raw, see next chapter on salads and relishes.

Vegetables should be washed thoroughly to remove soil and traces of spray. Root vegetables should be scrubbed; asparagus, spinach and other greens should be washed under running water to remove sand. Vegetables such as potatoes and carrots should not be pared or scraped until just before they are to be used. Peas and beans should not be shelled or corn husked until just before they are to be cooked. Outer leaves of cauliflower and cabbage should not be removed until just before they are to be used. In soaking vegetables in salted water to draw out insects, only a few minutes should be allowed. Soaking should be done before cutting or shredding. A larger loss of vitamins occurs when vegetables are cut in small pieces. Grated carrots, for instance, lose vitamins more quickly than the sliced vegetable.

When possible, vegetables should be cooked before they are pared or scraped, although the longer the time necessary for cooking, the greater the loss of minerals and vitamins. Whole potatoes and carrots demand a longer time to cook than those which have been sliced. All vegetables should be cooked as short a time as possible, as long cooking destroys vitamins and changes flavor, color and texture. Only a small amount of water should be used when vegetables are boiled. There will be a very small amount of evaporation if the utensil is tightly covered and if cooking is done over low heat. A heat-proof glass pot will demonstrate this fact, although the same results are achieved by any type of saucepan when the cover really fits. The use of a pressure cooker for cooking vegetables has improved the quality of some of those served on the American table, although for many young green vegetables little time is saved, and the results are no better than when the above directions are followed in using the saucepan.

The use of baking soda in the cooking of green vegetables has been frowned upon by nutritionists, because an alkali such as soda is known to hasten destruction of the vitamins of the B complex and ascorbic acid.

Good cooks also have objected to the use of soda because of the loss of natural flavor and texture. Some research work done at the University of Southern California showed that a very small amount of soda had no effect upon the vitamin content of peas cooked a minimum time which was shortened by the use of the soda. It is not known as yet whether other vegetables react in the same manner. However, the practice of adding soda is not recommended, because both in the home and in institutions, vegetables are apt to stand for a time before being eaten, and if left over and warmed up the soda tends to increase vitamin losses and still further affect flavor and texture.

GENERAL RULES FOR COOKING

1. Use only enough water to cover the bottom of the pan to a depth of ½ inch. (Exceptions to this rule are noted by an asterisk.) Spinach and other tender greens need no water.

2. Bring water to boiling point and add salt before vegetable is added.

3. Cover tightly and cook only until vegetables are tender.

TIMETABLE FOR COOKING

As vegetables differ in texture according to maturity, directions for cooking time can only be approximate.

Vegetable	*Minutes*
Artichokes	
American or Jerusalem	15-20
*French or Globe	20-30
*Asparagus	15-20
Beans	
String	15-30
Lima	20-30
Beets	20-60
Beet greens	10-20
*Broccoli	15-25
Brussels sprouts	10-20
Cabbage	5-10
Carrots	15-30
Cauliflower	10-30
Celery	10-15
*Corn	5-10
Cucumbers	10-15
Dandelion greens	10-20
Eggplant	10-15
Kohlrabi	20-30
Mushrooms	7-10
Okra	20-25
Onions	20-40
*Parsnips	30-50
Peas	8-15
*Potatoes	
White	20-30
Sweet	20-30
Spinach	6-10
Squash	
Summer	10-20
Winter	20-30
*Turnips	15-60

4. Do not drain the vegetables of mild flavor after cooking, unless the liquid is to be used in the preparation of a sauce.

5. Vegetables may be baked in tightly covered casseroles when the oven is being used for some other purpose. The time of cooking will be about one and a half times again as long as for boiling.

*6. Variations from the general rules: Whole artichokes, cauliflower and cabbage should be placed head up in utensil, and the amount of water should be increased to 1 inch. Stalks of asparagus and broccoli

cook best in a large skillet. The stalks should be arranged side by side in the boiling salted water. The skillet should be covered. For corn on the cob, potatoes, parsnips and turnips, water to a depth of 1 to 2 inches will be needed, depending upon the amount cooked at one time.

7. The use of a small pressure cooker for cooking vegetables will shorten the time. Directions with the utensil should be used.

General Directions for Frozen Vegetables

Frozen vegetables are packed in cartons, and if not to be used within eight hours should be placed in the freezing compartment of the refrigerator, where they will remain solidly frozen. They need not be thawed before cooking. If they have thawed, no attempts to refreeze them should be made. Quick-frozen vegetables may be cooked according to directions for other fresh vegetables. Place in boiling salted water, cover and continue cooking until tender. The time of cooking is generally a little shorter than that indicated for fresh green vegetables.

General Directions for Canned Vegetables

As canned vegetables are already thoroughly cooked, they need only heating and dressing to make them ready for the table. The liquid from the can may be drained and boiled 2 or 3 minutes in order to evaporate some of it. The vegetables may then be heated in this liquid. Canned tomatoes are of course an exception, as they are canned in their own juice.

General Directions for Dried Vegetables

Dried vegetables most commonly used are beans, peas and lentils. In some localities dried mushrooms are obtainable. Most dried vegetables need to be soaked before they are cooked. Any exception to this rule will be noted on the package and the time for cooking given.

DRESSINGS

Vegetables may be dressed with melted butter, brown butter or lemon butter, with cream or with a sauce. Butter and cream are used more often with vegetables than any other dressing. Vegetables cooked in a small amount of water need not be drained. When ready to serve, add 1 or 2 tablespoons butter or margarine or 2 tablespoons cream to each cup of cooked vegetable and reheat. For such vegetables as asparagus, broccoli and artichokes, the sauce often serves as a garnish and is poured over the drained vegetable just before it is served. Sauces of this type may be served in a separate dish if desired.

Flavored Butters

The butter may be melted and combined with lemon juice to taste before the vegetable is dressed. Spinach, string beans, cauliflower, broccoli, asparagus and beets may be dressed with lemon butter. Minced parsley may be added with the butter for dressing potatoes. Cut mint leaves may be used with peas. Butter may be browned slightly in a separate utensil and poured over such vegetables as cauliflower, broccoli or asparagus. A few grated dry

bread crumbs may be browned in butter for dressing cauliflower, broccoli, asparagus and onions.

Sauces

Sauces should blend or contrast in flavor with the vegetable with which they are to be served. They must be smooth and not too thick. When made in a small quantity, a cream sauce may thicken more than is desired. In this case, a little more liquid may be added. A sauce should be served as soon as possible after preparation, but if for any reason it is not, it should be well beaten before being combined with the vegetable.

Cream Sauce

Ingredients:

1 tablespoon butter or margarine
2 teaspoons flour
¼ teaspoon salt
Dash pepper
⅝ cup milk or milk and vegetable stock

Procedure: Melt butter or margarine in a small saucepan, stir in flour and seasonings. Stir in milk gradually and continue stirring over low heat until sauce thickens and boils. Yield: 3 servings.

NOTE: Add extra seasoning according to vegetable. This may be minced parsley, minced chives or grated onion, finely chopped celery, grated carrot or lemon juice. For dressing potatoes or macaroni reduce flour to 1½ teaspoons.

Cheese Sauce

Procedure: Follow directions for cream sauce. When sauce has thickened stir in 2 tablespoons grated cheese.

Chestnut Sauce

Procedure: Follow directions for cream sauce. When sauce has thickened add 2 tablespoons cut roasted chestnuts.

Quick Hollandaise Sauce

Procedure: Follow preceding directions for cream sauce. When sauce has thickened combine 2 teaspoons lemon juice with 1 slightly beaten egg yolk and 1 tablespoon butter or margarine and add to sauce, stirring constantly.

Hollandaise Sauce

Ingredients:

1 egg yolk
1 teaspoon lemon juice
¼ cup butter or margarine

Procedure: Place egg yolk in a very small saucepan, add lemon juice and mix thoroughly. Add half the butter or margarine, hold saucepan over a larger pan containing hot, but not boiling, water, and stir vigorously until butter is melted. Add remaining butter, continue stirring until butter is melted and sauce begins to thicken. Remove from heat at once. Yield: 2 servings.

Rich Cheese Sauce

Ingredients:

½ cup processed cheese
2 tablespoons cream
⅛ teaspoon paprika

Procedure: Processed cheese comes in package form under various brand names and melts easily. Combine cheese, cream and paprika in a small saucepan, stir over very low heat until cheese is melted. This recipe may be useful in allergic conditions when neither flour nor milk is allowed. Evaporated milk which can sometimes be taken when there is an allergy toward fresh milk may replace the cream. Yield: 3 servings.

MISCELLANEOUS RECIPES

Creamed Mushrooms

Ingredients:

1 cup (¼ lb.) mushrooms
1 tablespoon butter or margarine
2 teaspoons flour

¼ teaspoon salt
Pepper
½ cup top milk
⅛ teaspoon onion juice

Procedure: Wash mushrooms. Remove stems and slice, discarding tough ends. Peel mushrooms if necessary. Young, tender mushrooms need not be peeled. Slice caps or leave whole. Melt butter or margarine in small frying pan, add mushrooms and cook over low heat about 3 minutes (until tender), stirring occasionally. Stir in flour, salt and pepper. Stir in milk gradually and continue stirring over low heat until mixture thickens and boils. Add onion juice. Serve on hot toast or in croustades (p. 576). Yield: 1 liberal serving or 2 small servings.

Sautéed Mushrooms

Ingredients:
1 cup (¼ lb.) mushrooms
1½ tablespoons butter or margarine
⅛ teaspoon salt
Pepper

Procedure: Prepare mushrooms according to directions in preceding recipe. Melt butter or margarine in small frying pan, add mushrooms and cook over a low heat about 3 minutes (until tender), stirring occasionally. Season with salt and pepper and serve on hot toast. One teaspoon minced onion may be cooked with the mushrooms. Yield: 1 liberal serving.

Buttered Onions

Procedure: Wash and peel 4 white onions. Melt 1 tablespoon butter or margarine in small heavy saucepan, add onions, cover and cook over low heat about 20 minutes (until onions are tender). No seasoning is needed; the flavor of the onions will be sweet and delicate. Yield: 1 serving.

Baked Potatoes

Procedure: Wash and scrub 1 medium-sized or large potato. Grease skin lightly with butter or other fat. Bake on rack of moderately hot oven (425° F.) from 40 to 60 minutes, until potato is soft when pressed with a towel. Remove from oven, break skin open, put a pat of butter or margarine in opening, sprinkle with paprika and serve at once. If there is to be a delay in serving it, cover with cloth and keep in warm place.

Baked Potatoes, Stuffed

Procedure: Bake potato according to directions in preceding recipe. Remove from oven, cut slice from side, scoop out contents with a teaspoon and put through ricer. Add 1 tablespoon butter or margarine and enough hot milk to give a creamy consistency. Add salt and pepper to taste, beat until fluffy and pile lightly in potato shell. Return to hot oven (450° F.) and bake about 10 minutes (until lightly browned). Yield: 1 serving.

Mashed Potatoes

Procedure: Scrub 2 medium-sized or 1 large potato. Boil in salted water until tender. Drain, peel and put through ricer. Add 1 tablespoon butter or margarine and enough hot milk to give a creamy consistency. Add salt and pepper to taste, beat until fluffy and serve at once. Yield: 1 serving.

Stewed Potatoes

Ingredients:
1 tablespoon butter or margarine
¾ cup diced cooked potatoes
¾ cup top milk
Salt, pepper
1 teaspoon minced parsley

Procedure: Melt butter or margarine in small heavy frying pan, add potatoes and stir over low heat until butter is absorbed. Add milk and cook over low heat about 10 minutes until mixture is

thick. Add more milk if necessary. Season to taste with salt and pepper. Sprinkle with parsley. Yield: 1 serving.

Spinach

Procedure: Remove roots and other leaves with sharp knife, place in pan and allow water from faucet to run over leaves. Remove leaves to another pan and repeat process until no sand accumulates in the bottom of the pan. Cook in covered utensil without extra water. When tender, dress without draining or drain and reserve liquid for soup. Cooked spinach may be chopped before dressing with butter or margarine, cream or French dressing or cream sauce.

NOTE: Other greens may be prepared in the same way, a little water being added with the less tender green. If patient must avoid oxalic acid, spinach should be cooked in plenty of boiling water.

Baked Squash

Procedure: Wash, halve and seed one small acorn squash. Brush with butter or margarine or add a few tablespoons cream to each half. Sprinkle with salt and pepper. Place in small baking dish, add water to depth of ½ inch and bake in moderately hot oven (400° F.) 30 minutes until tender. Yield: 2 servings.

Baked Tomatoes

Procedure: Wash 1 medium-sized tomato and cut in half. Arrange halves in baking dish and sprinkle with salt, pepper, sugar, minced onion and chopped parsley. Dot with butter or margarine or small pieces of bacon and bake in moderate oven (350° F.) about 25 minutes (until tender). Yield: 1 serving.

Broiled Tomatoes

Procedure: Prepare tomatoes according to directions in preceding recipe. After seasoning, cover with soft buttered bread crumbs. Broil about 3 inches from medium heat until crumbs are browned. Yield: 1 serving.

Stewed Tomatoes

Procedure: Wash and peel 2 medium-sized tomatoes, cut in quarters and put in small saucepan. Add 1 slice onion and salt, pepper and sugar to taste. Cook over low heat about 10 minutes and add 1 tablespoon butter or margarine. One half cup of croutons (p. 576) may be added just before serving. One cup of canned tomatoes may replace the fresh tomatoes. Yield: 1 serving.

STUDY QUESTIONS

1. Is the botanical classification of vegetables an indication of food value?
2. What are the most valuable contributions vegetables make to the diet? List the vegetables in order of ascorbic acid content.
3. Discuss the losses of vitamins from vegetables due to cooking.
4. Compare the nutritive contributions of fresh, canned and frozen vegetables.
5. What care should vegetables be given in the home kitchen? In storage? In preparation for cooking?
6. Give the general rules for cooking vegetables and the reasons for the accepted method.

Salads and Relishes

LEAFY VEGETABLES IN SALADS
OTHER SALAD VEGETABLES
SALAD COMBINATIONS
SALAD DRESSINGS
SALADS AND RELISHES IN THE MENU
PREPARATION OF RELISHES
RECIPES FOR SALADS
RECIPES FOR SALAD DRESSINGS

The term "salad" now covers innumerable combinations of vegetables, fruits and other food materials which are served crisp and cold with a dressing.

Salads may be divided into two classes. In the first are those which act as appetizers or savories. Except for the dressing served with them, they have little fuel value but are important from the point of view of minerals and vitamins, in which raw fruits and vegetables are particularly high. (See Chaps. 39 and 45.) In the second are those of high nutritive value and protein content from fish, meat, eggs, cheese and nuts which are combined with lighter fruits and vegetables. The latter may be used as the main course for luncheon, but they seldom appear on the dinner table.

A mixed green salad may be served on a chilled plate or in a chilled bowl. Small wooden salad bowls are now obtainable. The dressing may be served in a small pitcher and combined with the salad after the tray has been taken to the patient's room, or the dressing may be mixed with the greens just before the salad is put into the bowl.

Salads made of mixed vegetables and of fruits garnished with salad greens may be served on a salad plate.

Mayonnaise should be placed on top of a mixed vegetable or a fruit salad rather than mixed with it.

The term "relish" is used to describe raw vegetables such as celery, radishes, carrot strips and others which are served without a dressing. They may replace the salad or they may be served in addition with the soup or with the main course. For the invalid tray, relishes may be arranged on the bread and butter plate.

LEAFY VEGETABLES IN SALADS

The most popular and plentiful of the salad plants is lettuce, but there are many other delicious succulent leaves, which, when they can be obtained, may be used to take its place. The quality of lettuce which can be obtained all the year round in almost all sections of the country has improved enormously in the last few years, for its growing popularity has given it a greater market value. Boston and iceberg lettuce, the most

plentiful, are different in flavor and in texture, and equally satisfactory to serve as salads. Romaine, escarole, Chinese cabbage, endive of two types and water cress are other greens which should be considered when they are in the market. The leaves of raw spinach and tender young Swiss chard, sorrel, field grass and dandelion greens are other suggestions. Usually the choice is governed by taste and the grades which are available at the time the purchase is made.

It has been the custom to discard the outer green leaves, which are not so tender and crisp as the inner bleached leaves. It has been shown, however, that these green leaves have a higher vitamin content, and where they are in good condition they should be used. Shredded for sandwiches or used as a basis for other ingredients, they are acceptable. Shredded lettuce sandwiches usually are attractive to children and invalids for luncheon.

To prepare lettuce and other greens for serving, wash the heads in several waters, pulling the leaves apart; shake off as much water as possible and place in a tightly covered container or a plastic bag, or wrap in a towel or sheet of cellophane or foil. Place in refrigerator in a cold place (but above freezing temperature) and allow to crisp for at least an hour. Greens will keep fresh and in good condition for a number of days under this treatment.

OTHER SALAD VEGETABLES

Cabbage is a favorite ingredient for salad. It is also often used by itself and when mixed with a cooked dressing is known as cole slaw. It may be served on bright green salad leaves or garnished with strips of green pepper or pimiento to add a note of color. To prepare, wash the head, remove outer leaves and immerse the head in cold salted water for a short time. Drain well before shredding. Red cabbage may replace or be mixed with the staple white or green cabbage.

Cucumbers are used as an ingredient of a mixed green salad or they may be sliced and served with French or sour-cream dressing. Minced onions or chives are generally used in combination with cucumbers. To prepare, wash before placing in refrigerator. If chilled thoroughly, it is not necessary to crisp in salted water after slicing. Cucumbers may be served pared or unpared.

Tomatoes are also used as an ingredient of a mixed salad or they may be served in sliced form with a French dressing. Sometimes the whole tomato, from which some of the pulp has been removed, is stuffed with a mixed vegetable salad. To prepare, wash and place in the refrigerator to chill, or remove skins by plunging into boiling water before chilling in refrigerator. They may be cut in quarters or sliced and marinated in French dressing before being chilled.

Celery in diced form is often used as an ingredient in a salad. Until time to use, the partially trimmed stalks should be kept wrapped or covered in refrigerator.

Carrots are becoming a favorite as an ingredient of a salad. Young carrots, after the removal of part of the tops, should be covered and placed in the refrigerator. They should be scraped and cut just be-

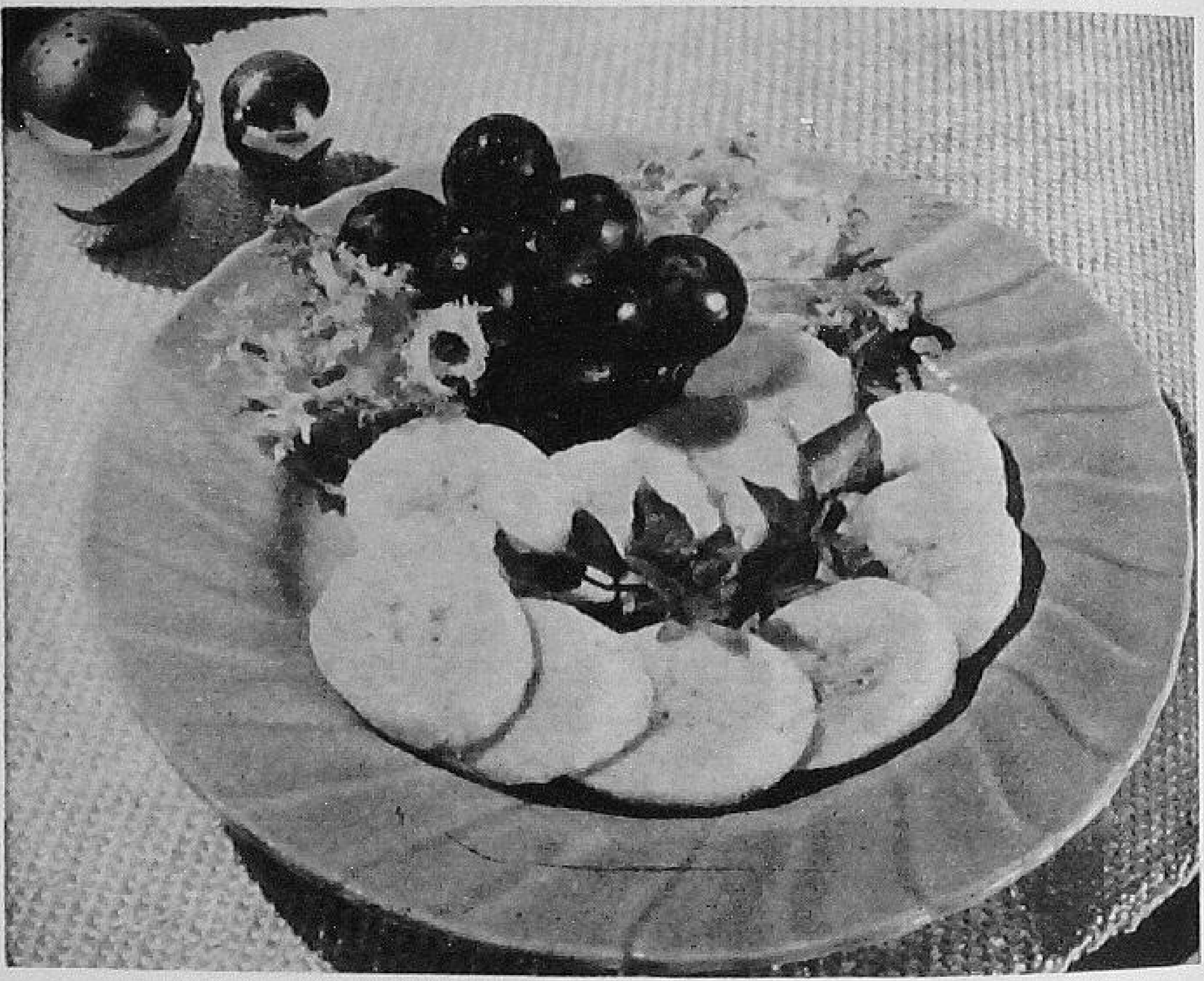

FIG. 112. An attractive fruit salad combination.

fore they are to be used. Carrot strips are often used as a garnish for other salads.

Other Salad Ingredients. Finely cut sticks of yellow or white turnip, cauliflower, green pepper and American artichokes in raw form are sometimes used in mixed salads. Many leftover cooked vegetables such as carrots, string beans, peas or cauliflower may also be used. Cooked spinach mixed with a well-seasoned French dressing may be pressed into small molds, chilled in the refrigerator and served on a bed of salad greens.

Substitutes for Salads. Raw vegetables may be served as relishes rather than in salads. This may be desirable when rich food must be avoided. Tender hearts of celery, crisp radishes and carrot sticks are most commonly used. Flowerets of cauliflower, strips of turnips and young scallions may also be used if allowed.

SALAD COMBINATIONS

The simplest and best salads which will be most used in the diet of an invalid are the green leaves served with a dressing of some type. Where possible, variations in the kind of leaves served should be made. Romaine, endive of either type, or water cress should appear occasionally on the tray. Cabbage, if finely

cut, may also be used and should find favor because it is the cheapest green vegetable during most of the year. A variation in the garnish, a ring of green pepper or pimiento, a brightly colored radish or a piece of beet shaped attractively will suggest variety, even when the basis of the salad is the same.

Fruit Salads. When fruits are used for salad, care should be taken in their combination. Usually salads are more appetizing when few varieties are used in the same combination. Grapefruit and white grapes with a cherry garnish, orange and date, or grapefruit and melon are more attractive both to sight and to taste than a mixture of all of them.

Heavier Salads. When the heavier salads are used as main dishes for lunch or supper, cheese and eggs are often recommended. Meat or fish, mixed with mayonnaise or cooked dressing, makes a combination which may be too rich for some patients. A stuffed egg, a mold of cottage or cream cheese accompanied by a mixed vegetable salad or by the green leaves alone, is usually well liked. A small amount of mayonnaise may be used as a garnish when it is allowed.

Gelatin Salads. Gelatin combined with tomato or fruit juices provides a means of putting extra vegetables and fruits into the diet. Gelatin salads are usually liked and give variety and attractiveness to the invalid's tray.

SALAD DRESSINGS

French dressing is used more often for invalids than any other kind. This is a simple combination of oil, vinegar or lemon juice and seasonings. Olive oil is considered best for the preparation of dressing, but some people do not care for its flavor. During World War II it was replaced entirely by a salad oil made from corn, cottonseed, peanuts or soy. These oils are generally of bland flavor and have better keeping qualities than olive oil. Care must be taken to keep the oil as nearly airtight as possible and in a cool place. If the bottle is clear glass, keeping it in a dark place is an added precaution against rancidity. Rancid oil served even once by mistake may cause an invalid to refuse to take salad again, and thus make it more difficult to introduce the proper amounts of fruits and vegetables into the diet. After the bottle or can has been used, the top should be wiped carefully.

Oil is also an asset when a diet of high nutritive value is necessary. Mineral oil should not be used in a salad dressing, as it inhibits the absorption of the fat-soluble vitamins A, D, E and K. Because it has no caloric value, it was often used in both French dressing and mayonnaise for the reducing diet. Salad dressing should be savory, but not overseasoned with condiments, particularly for invalids. If vinegar is forbidden, lemon juice may be substituted for it in most dressings. If oil is forbidden or not liked, lemon juice by itself or mixed with orange juice will give a desirable flavor.

Mayonnaise, an emulsion of oil, egg yolks and acid, should usually be thinned with lemon juice rather than with vinegar. A little catsup or chili sauce added to mayonnaise may be used instead of other seasoning

as a variation. It gives color as well as savor to the salad.

Sour-Cream Dressing. There is no dressing more useful in the invalid's diet than sour-cream dressing. It is generally liked and can be taken easily in most cases. Sour cream should be purchased as such, as unfavorable bacteria instead of the lactic-acid type may develop in pasteurized cream kept under home conditions. Whipped sweet cream may replace sour cream, if an extra amount of vinegar is added to the recipe (see p. 559).

Cooked Dressing. A cooked dressing often known as a boiled dressing, although it should be made in a double boiler, is particularly appropriate for potato and cabbage salad and may be preferred as a dressing for greens. A cooked dressing with a fruit-juice base is a good choice for use with fruit.

SALADS AND RELISHES IN THE MENU

Through the use of salads and relishes, both the nutritive quality and the attractiveness of the meal can be improved. Salad greens are used either as an ingredient or as a garnish for every type of salad. The use of relishes instead of or in addition to salad is a means of serving vegetables in raw form, in which they contribute practically all their natural vitamin and mineral content.

Through different combinations of fruits and vegetables and through serving them in jellied form with salad greens there can always be variety in both flavor and appearance. If the patient prefers a mixed green salad and welcomes its appearance daily, there is no reason why it should not be served. Different dressings may be served, or the standard French dressing may appear daily, according to the taste of the patient.

The following standards will be helpful in preparing salads. The first three standards apply to relishes also:

1. They should be cold and crisp.
2. They should be attractive to the eye.
3. They should be simple rather than elaborate.
4. They should have a dressing which is well but moderately seasoned.
5. They should be varied either as to combination or to dressing from day to day.

Preparation of Relishes

Celery, radishes and carrot strips are the relishes most used. Scallions, flowerets of raw cauliflower, strips of young turnip and green pepper and thin wedges of cucumber may also be used. The hearts of celery are generally chosen for the invalid's tray, although the outer stalks of the green Pascal celery are tender enough to be acceptable. Cut stalks of celery may be stuffed with a flavored cottage or cream cheese or with a blend of a highly flavored cheese with cream or cottage cheese.

All vegetables should be washed carefully and trimmed. Carrots should be scraped before being sliced into thin strips. Although it is customary to soak these vegetables for half an hour or more in salted water, some of the nutrients

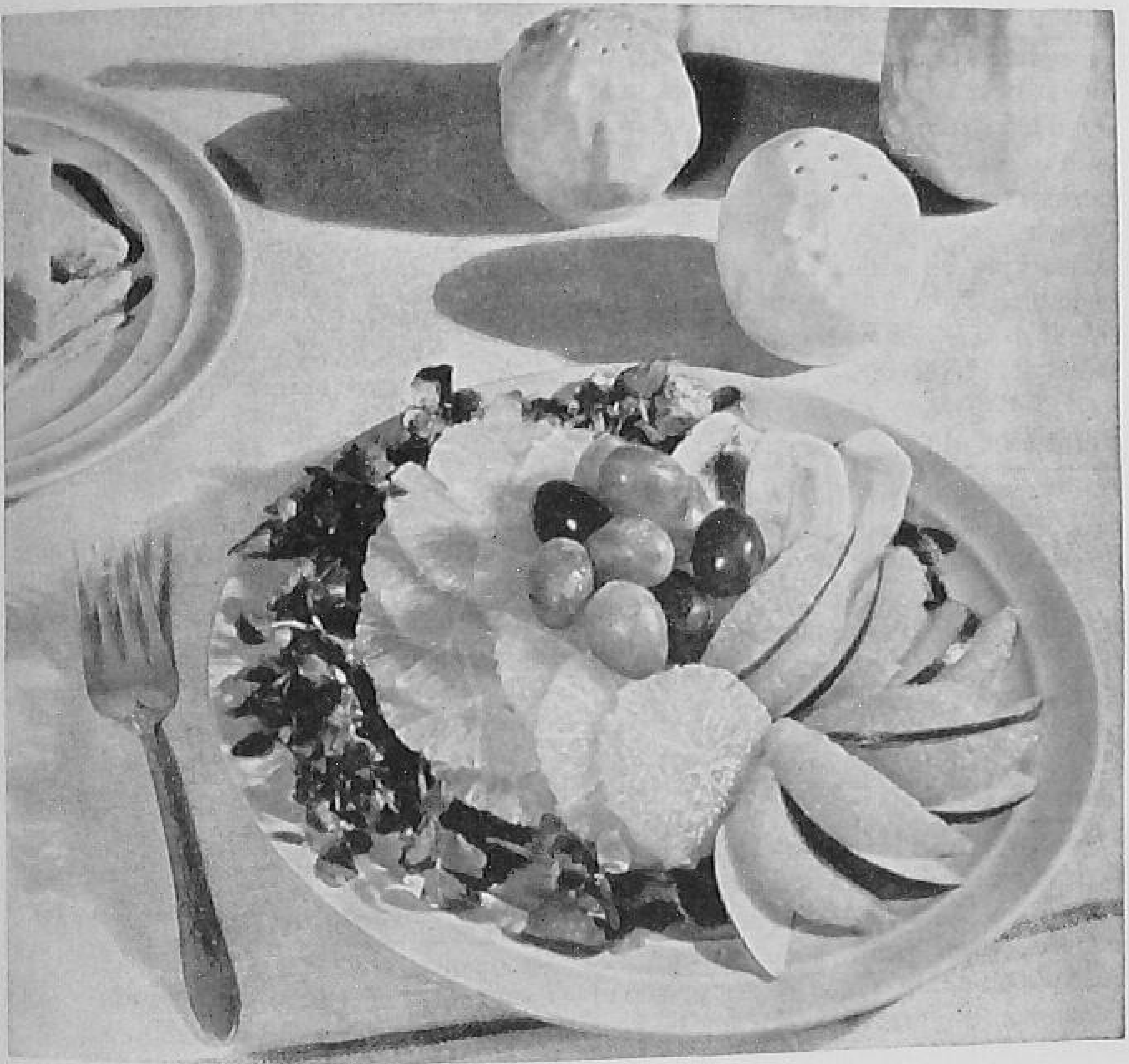

FIG. 113. Fruit salad plate may be a good choice for luncheon or supper.

may be lost. This will also be the case when they are allowed to stand after they have been prepared. Vegetables to be served as relishes should preferably be prepared just before they are to be used. If it is necessary to prepare them earlier, they should be placed in a covered dish in the refrigerator. As relishes are more appetizing when chilled, there may be a good reason for preparing them an hour or two before serving. A salt shaker on the invalid's tray should accompany relishes.

RECIPES FOR SALADS

VEGETABLE SALADS

Mixed Green Salad

Procedure: Crisp lettuce, romaine or other salad greens may be combined with any raw vegetable such as sliced cucumbers, radishes, sliced onions, shredded carrots, cabbage, green pepper or sliced skinned tomatoes. The ingredients must all be crisp and cold and tossed with French dressing just before they are served. For preparation of cucumbers and tomatoes see cucumber salad and tomato salad (p. 551).

Mixed Vegetable Salad

Procedure: Cooked vegetables such as diced beets, peas, Lima beans and shredded string beans may be combined with a small amount of shredded raw carrots or diced celery and well-seasoned French dressing. Minced onions or chives may be added if desired. Serve in lettuce cup with mayonnaise on the side if desired. Allow ½ cup mixed vegetables for 1 serving.

Potato Salad

Procedure: Mix ½ cup cold diced potatoes with ¼ cup diced celery, 1 teaspoon minced onion and 1 tablespoon French dressing. Just before serving add 1 tablespoon mayonnaise or cooked salad dressing. Serve on lettuce and garnish with minced parsley or green pepper. Yield: 1 serving.

Tomato Salad

Procedure: Scald tomato 1 minute in boiling water. Drench with cold water and drain. Peel and slice or cut into eighths, dress with French dressing. Add sliced onion, diced celery or sliced cucumber if desired. Serve on bed of lettuce with mayonnaise on the side. Yield: 1 serving.

Small skinned tomatoes may be cut in quarters and almost to stem end and arranged on lettuce. The tomato cup may be filled with mixed vegetable, chicken or fish salad.

A slice may be removed from the stem end and the center pulp removed, in which case fill center with any fish, meat or vegetable salad. Serve on lettuce and garnish with mayonnaise.

Asparagus Salad

Procedure: Arrange drained and chilled cooked or canned asparagus on bed of lettuce or romaine. Sprinkle with French dressing and garnish with strips of pimiento. Grated cheese may be sprinkled over the asparagus if desired. Allow from 4 to 6 asparagus stalks for 1 serving.

Cabbage Salad

Procedure: Mix shredded cabbage with French dressing, cooked salad dressing, sour cream dressing or mayonnaise. Add minced onion, green pepper or pimiento to the salad, or use as a garnish. Serve in lettuce cup or on other salad greens. Allow 1 cup shredded cabbage for 1 serving.

Cucumber Salad

Procedure: Wash and chill cucumbers. Pare and slice. If cucumbers have not been chilled they may be placed in salted ice water for about 15 minutes after being sliced, and then drained. Dress with French dressing or sour cream dressing; add minced onions, scallions or chives if desired. Allow ¼ cucumber for 1 serving.

Jellied Vegetable Salad

Ingredients:

- 1 teaspoon granulated gelatin
- 1 tablespoon cold water
- ⅓ cup boiling water
- 2 teaspoons sugar
- ⅛ teaspoon salt
- 1 tablespoon lemon juice or mild vinegar
- ½ cup finely diced celery
- 2 teaspoons chopped green pepper
- 2 teaspoons chopped pimiento

Procedure: Soften gelatin in cold water and dissolve in boiling water. Add sugar and salt, stir until dissolved. Chill until mixture begins to thicken. Stir in lemon juice or vinegar and vegetables and pour into 2 small molds. Chill until set. Unmold on salad plate and garnish with lettuce or other salad greens. Serve mayonnaise on the side. Yield: 2 servings.

Note: Shredded cabbage may replace part or all of the celery.

Cheese and Egg Salads

Cottage Cheese Salad

Procedure: Mix ⅓ cup cottage cheese with 1 teaspoon minced onion or chives and 1 teaspoon minced parsley. If dry cheese is used, moisten with cream. Pack in a small buttered custard cup and chill for half an hour. Unmold and serve with water cress or shredded lettuce. Serve with French dressing. Yield: 1 serving.

Cream Cheese Salad

Procedure: Soften cream cheese with fork. Add a small amount of cream if necessary. Form cheese into balls and roll in minced parsley or paprika. Serve on bed of water cress and sprinkle with French dressing. The cheese may be flavored with minced chives or minced onion if desired. Allow from 1 to 2 ozs. cheese for 1 serving.

Stuffed Egg Salad

Procedure: Follow directions for stuffed eggs (p. 482). Serve on lettuce and garnish with mayonnaise.

Fruit Salads

Apple and Celery Salad

Procedure: Pare, core and dice ½ medium-sized apple; combine with an equal amount of diced celery and enough mayonnaise to moisten. Serve in a lettuce cup and garnish with mayonnaise and with 2 or 3 pecans or walnut halves. Yield: 1 serving.

Fresh Fruit Plate

Procedure: Arrange alternately berries in season, sliced pineapple, sliced melon or sections of grapefruit or orange round edge of plate and sprinkle with French dressing. In the center place lettuce cup containing mayonnaise. Cream cheese balls may be used as a garnish. Serve as main luncheon dish.

Grapefruit and Orange Salad

Procedure: Arrange alternate sections of grapefruit and orange on leaf of lettuce or romaine. Sprinkle with French dressing and garnish with sliced ripe olives or green pepper. Allow 3 sections each of grapefruit and orange for 1 serving. Sliced pared avocado may replace the orange or the grapefruit.

Melon Salad

Procedure: Cut peeled cantaloupe, honeydew or watermelon into balls or cubes. One or all types of melon may be used. Sprinkle with French dressing and chill in refrigerator. Serve on shredded lettuce. Allow from 8 to 10 balls for 1 serving.

Jellied Fruit Salad

Procedure: Follow directions for jellied vegetable salad (p. 556), substituting any combination of diced fresh fruits, with the exception of fresh pineapple, for the celery.

Mixed Fruit Salad

Procedure: Almost any combination of mixed fresh or canned fruits may be used for a mixed fruit salad. Diced apple, fresh pineapple, seeded halved grapes, sections of orange and grapefruit, slices or balls of melon, canned apricots or peaches, pitted sweet cherries and sliced bananas are all used as ingredients for fruit salads. Generally not more than 3 or 4 fruits are combined. The fruit should be chilled and combined just before it is to be served. Arrange fruit on lettuce, sprinkle with French dressing and garnish with mayonnaise or cooked fruit salad dressing. Allow about ¾ cup mixed fruit for 1 serving.

Meat and Fish Salads

Chicken Salad

Procedure: Combine ½ cup diced cooked chicken with an equal amount of diced celery. Add 1 tablespoon French dressing and chill half an hour. Serve in lettuce cup and garnish with mayonnaise and stuffed olives or with sliced hard-cooked egg. Leftover cooked pork or veal may replace the chicken. Yield: 1 serving.

Crabmeat Salad

Procedure: Follow preceding directions for chicken salad, substituting flaked fresh or canned crabmeat for chicken. A teaspoon minced onion may be added if desired.

Shrimp Salad

Procedure: Cooked, fresh or canned shrimps may be used. Remove black vein. Arrange on lettuce, sprinkle with French dressing and serve Russian dressing on the side. Allow from 4 to 6 shrimps for 1 serving.

RECIPES FOR SALAD DRESSINGS

Recipes are given in family quantities as they can be stored in refrigerator. They may be halved if desired.

Cooked Salad Dressings

Cooked Fruit Salad Dressing

Ingredients:
- 2 egg yolks
- ¼ cup sugar
- ¼ cup orange juice
- ¼ cup pineapple juice
- 2 tablespoons lemon juice
- ½ cup whipped cream or sour cream

Procedure: Beat egg yolks in top of double boiler, add sugar and beat until well blended. Stir in fruit juices and cook over hot water, stirring constantly until mixture thickens. Cool and fold in cream. Serve with fruit salad. Yield: About 1½ cups.

Note: Pineapple juice may be replaced by the same amount of orange juice.

Cooked Salad Dressing

Ingredients:
- 2 teaspoons salt
- 1 teaspoon dry mustard
- 4 teaspoons sugar
- Dash cayenne
- 2 tablespoons flour
- 2 eggs or 4 egg yolks, slightly beaten
- 1 cup scalded milk
- ½ cup vinegar

Procedure: Mix dry ingredients in top of a small double boiler. Add slightly beaten eggs or yolks, stir in milk and vinegar. Stir over hot water until mixture thickens. Chill and when ready to serve thin with sour cream. Store in covered jar in refrigerator. Yield: About 1½ cups.

French Dressings

French Dressing

Ingredients:
- ½ teaspoon salt
- ⅛ teaspoon pepper
- ½ teaspoon sugar
- ½ teaspoon dry mustard
- ½ teaspoon paprika
- ½ cup salad oil
- 2 tablespoons mild vinegar

Procedure: Mix seasonings, add oil and stir until well blended. Add vinegar and beat or shake well until mixture thickens slightly. Store in refrigerator. Beat again just before serving. Onion juice may be added if allowed. Yield: ⅔ cup.

Chiffonade Dressing

Procedure: Add 1 teaspoon each minced celery, green pepper, raw carrot or stuffed olives to 1 serving (2 tablespoons French dressing). Chopped hard-cooked egg may also be added.

Fruit French Dressing

Ingredients:

¼ teaspoon salt
½ teaspoon paprika
⅛ teaspoon sugar
¼ cup salad oil
2 tablespoons orange juice
1 teaspoon lemon juice

Procedure: Mix seasonings, add oil and stir until well blended. Add orange and lemon juice and beat thoroughly. Beat or shake just before serving. Yield: About ⅓ cup.

Roquefort Dressing

Procedure: Add crumbled Roquefort cheese to French dressing.

Mayonnaise

Mayonnaise

Ingredients:

½ teaspoon dry mustard
1 teaspoon salt
½ teaspoon sugar
1 egg yolk
2 tablespoons lemon juice or vinegar
1 cup salad oil

Procedure: Mix mustard, salt and sugar; add egg yolk and mix well. Stir in 1 teaspoon lemon juice or vinegar, add oil gradually drop by drop at first while beating with rotary egg beater. As dressing thickens add lemon juice or vinegar by the teaspoon and continue adding oil until stiff. Keep in covered jar in the refrigerator. Yield: Approximately 1¼ cups.

Note: For fruit salad, fold in just before serving ¼ cup heavy sweet or sour cream, whipped, to an equal amount of mayonnaise.

Russian Dressing

Procedure: Combine mayonnaise with an equal amount of chili sauce. Minced chopped onion and minced chopped green pepper may be added.

Other Dressings

Bacon Dressing

Ingredients:

1 strip bacon
1 teaspoon sugar
2 tablespoons vinegar

Procedure: Cut bacon in 1-inch squares and sauté in small frying pan until slightly crisp. Add sugar and vinegar, stir until sugar is dissolved and pour at once over lettuce, shredded cabbage, young spinach leaves or other salad green. Yield: 1 serving.

Sour Cream Dressing

Ingredients:

1 teaspoon salt
¼ teaspoon paprika
¼ cup sour cream
Vinegar to taste

Procedure: Mix seasonings, add cream and beat well. Add vinegar. Whipped sweet cream may be used if extra vinegar is added. One teaspoon minced onion or chives may be added. Yield: About ¼ cup.

STUDY QUESTIONS

1. Salads as now served may be divided into two classes. What are these classes?

2. Probably the most popular and the most plentiful salad plant is lettuce. Name some other salad plants.

3. It has been the custom to discard the outer green leaves of salad plants. Why should these leaves be used?

4. When fruits are used for salad, care should be taken in their combination. Why?

5. Plan a luncheon featuring an appropriate salad as a main dish.

6. Plan a luncheon or supper using an appropriate salad as an accessory to a main dish.

Soups

READY-TO-USE SOUPS
CLEAR SOUPS
UNTHICKENED MILK SOUPS
CREAM SOUPS

Soup, which in the normal diet is often considered an accessory to the meal, may have a more important place in the diet of the ill and the convalescent. A liquid diet will be ordered by the physician for a short or a long period when a patient is unable to handle solid food, or when appetite for any type of food may be completely lacking and the patient may be more easily persuaded to take nutritious food in liquid form. A soup made with milk may carry a worth-while amount of important nutrients. A hot clear soup, while contributing little nutritively, is sometimes "comforting to the stomach" and may serve to stimulate digestive secretion and thereby create a desire for other food. For this reason, a clear soup makes a good beginning for lunch or dinner, even after the patient has begun to take food in meal form. In cases where a high caloric diet is part of the treatment, a cream soup, or at least one made with milk, may be preferred at the beginning of the meal.

READY-TO-USE SOUPS

The nurse, who will have many other duties to perform for her patient besides that of preparing an appetizing tray for each meal, will often take advantage of the variety of canned soups of excellent quality and flavor which are now available. These range from consommé to condensed vegetable soups in good variety. The bouillon cubes and powders with a meatlike flavor and the condensed meat extract may also be useful on occasions when a quickly prepared hot liquid is desirable. Higher in food value are the dehydrated vegetable soups usually made from a pea or a bean base which, when prepared, are rather like a pottage, and the combinations of bouillon powder and dehydrated vegetables. These may have a place on the menu when the patient has returned to normal diet.

Both canned and dehydrated vegetable soups may be diluted with milk, both to increase food value and to improve flavor. In the beginning of convalescence, a comparatively large amount of milk should be used when the patient does not care for the normal amount of seasoning. Cream may be used for dilution if it is desirable to increase the calories. Tomato juice, hot or cold, with or without extra seasoning, can serve as a quick and easy soup. A

FIG. 114. An attractive tray for the sick child—soup and sandwiches cut in animal shapes.

combination of tomato and clam juice may be purchased already mixed, or the products may be bought separately and combined. Chicken consommé may also be combined with either of the above-mentioned products.

CLEAR SOUPS

Clear soups are prepared from both meat and poultry. Directions and recipes for these will be found in Chapter 43, Meats. Clams furnish the one fish product used for broth which may also be called a clear soup. A combination of chicken stock and clam broth is particularly good.

Clam Broth

Ingredients:

- 6-10 clams in shell
- 1 cup water
- Dash salt
- Paprika

Procedure: Choose chowder clams, if possible, in the shells. Scrub thoroughly with a brush, rinse, place in kettle with cold water, cover and bring to boiling

point. Remove clams from broth as soon as shells have opened. The clams may be served at once in the shell or in any other way. Allow broth to settle, strain, reheat, add salt and paprika to taste and serve hot. Yield: 1 serving.

Clam broth may be served hot or cold with 1 heaping teaspoon whipped cream, into which a little salt and pepper have been beaten.

Consommé Bellevue

Ingredients:
- ½ cup chicken stock
- ½ cup clam broth

Procedure: Thoroughly mix chicken broth with clam broth, heat and serve in bouillon cup. Garnish with 1 tablespoon whipped cream. Yield: 1 serving.

UNTHICKENED MILK SOUPS, CHOWDERS AND STEWS

Basic Recipe for Soups with a Milk Base. Soups with a milk base are used largely in the invalid's diet. Among these an oyster stew is popular. Well-seasoned, finely cut or puréed cooked vegetables may be combined with milk and cream, with milk and chicken or other white stock, without the addition of any thickening. When several vegetables are used, or when fish and vegetables are combined, soups of this type are known as chowders. Unthickened soups may be useful when there is an allergic condition toward wheat.

Celery Soup

Ingredients:
- ½ cup diced celery
- 2 slices onion
- ½ cup water
- ½ teaspoon salt
- ½ cup top milk
- Dash pepper
- 1 tablespoon minced parsley

Procedure: Combine celery, onion, water and salt; cover and cook over low heat until celery is tender (about 5 minutes). Add milk and bring almost to boiling. Combine with celery-onion mixture. Add more seasoning if necessary and serve garnished with minced parsley. Yield: 1 serving.

Potato Soup

Ingredients:
- 1 medium-sized potato
- 2 slices onion
- ¼ teaspoon salt
- ¾ cup milk
- 1 tablespoon butter
- 1 tablespoon minced parsley
- Dash pepper

Procedure: Pare and dice potato, add enough water to cover, then onion and salt. Cover and cook until potato is tender. Strain and force through a sieve. Heat milk, combine with potato and stir over low heat until very hot. Add butter, parsley and pepper; beat well. If soup is too thick, add more milk and reheat. Also add more salt if necessary. Yield: 1 serving.

Vegetable Chowder with Milk

Ingredients:
- 1 tablespoon butter
- ¾ cup diced vegetables (potato, celery, carrots, peas)
- 2 slices onion
- ½ cup water
- ½ cup top milk
- Salt
- Pepper

Procedure: Melt butter, add vegetables, cook 2 minutes, stirring constantly. Add water, cover and cook about 10 minutes (until vegetables are tender). Add milk, season to taste with salt and pepper and reheat. Yield: 2 servings.

Oyster Stew

Ingredients:
- 4-6 oysters
- 1 tablespoon butter

1 cup milk
¼ teaspoon salt
Dash pepper
Dash paprika

Procedure: Look over oysters to remove any pieces of shell which may be present. Melt butter, add drained oysters and cook 2 minutes until edges curl. Add remaining ingredients and cook over low heat until milk is thoroughly heated. Stir occasionally during cooking. Yield: 1 serving.

CREAM SOUPS

A combination of thin cream sauce with a purée of vegetable or fish, or with a rich stock which is usually chicken or veal, is known as a cream soup or a bisque. If a soup of this type is not thickened, it may "separate," leaving melted fat on the top, which is unattractive. Cream sauce is used to "bind" the materials and to make a smooth, creamy soup. A general rule is to use one half as much vegetable or fish pulp as cream sauce. As it is impossible to make cream sauce in a very small quantity, each of the recipes which follow will furnish one generous serving which may be used to provide a goodly part of the meal, or two servings when soup is to be served as a first course.

Often the choice of cream soups will be made when leftover cooked vegetables are on hand. As they will need further cooking to make them soft enough to go through a sieve, the directions which follow for the preparation of vegetable purée may be used for both raw and cooked vegetables. Puréed vegetables may be purchased in canned form. While both vegetables and the cream sauce which forms the base are seasoned, soups should be tasted before they are served and more seasoning should be added, if necessary. If the consistency of the soup is thicker than cream, a little more milk should be added and the soup reheated. For high caloric soup, one half the milk in the recipe for basic cream sauce may be replaced by cream, or extra butter may be added just before serving. With highly flavored vegetables, undiluted evaporated milk or a double amount of powdered milk when reconstituted with water may be used to increase both caloric and protein content.

Purées. Cream soups are sometimes called purées. The fish or vegetables used in their preparation are forced through a very fine sieve in order to produce a particularly smooth soup.

Bisques. The term bisque is generally used for cream soup made from shellfish, or it is sometimes applied to a vegetable cream soup. Sometimes the shellfish are chopped rather than pressed through a purée sieve.

Basic Cream Sauce for Soup

Ingredients:
1 tablespoon butter
1½ teaspoons flour
¼ teaspoon salt
Dash pepper
¾ cup milk

Procedure: Melt butter in small saucepan, stir in flour and seasonings. Stir in milk gradually and continue stirring over low heat until sauce thickens and boils. If there is an allergy toward wheat, 1 teaspoon cornstarch may replace 2 teaspoons flour. Yield: Approximately ¾ cup sauce.

Fig. 115. A milk vegetable soup with parsley garnish.

Fresh Vegetable Purée for Cream Soups

Procedure: Allow ¾ cup finely diced vegetables, such as celery, carrots or asparagus, ½ cup diced beets, potatoes, onions, or cut or canned corn, 1 cup fresh or canned peas, 1½ cups spinach or lettuce leaves to flavor one portion of cream soup. Place vegetables in small saucepan, add ½ cup water, ¼ teaspoon salt and a dash sugar. Add 1 or 2 slices onion if allowed. Cover and cook over low heat until vegetables are tender and force through sieve or ricer.

Canned Vegetable Purée

Procedure: Drain vegetable, combine ¾ cup diced vegetable with ½ cup liquid from can. Follow preceding directions or use canned strained vegetables (baby food).

General Recipe for Cream Soup

Ingredients:

½ cup vegetable purée
¾ cup basic cream sauce
Seasonings

Procedure: Prepare purée. Make cream sauce, add purée and beat well. Add more salt and pepper to taste and other seasonings. Add according to suggestions given below and reheat. Cream soups may be garnished with 1 tablespoon whipped cream sprinkled with paprika. Yield: 1 serving.

Cream of Asparagus Soup

Procedure: Follow general recipe for cream soup. Add a few drops lemon juice and garnish with cooked asparagus tips.

Cream of Beet Soup

Procedure: Follow general recipe for cream soup. The cooked beets may be finely chopped instead of being forced through a sieve, if desired. Flavor with a few drops lemon juice and top with sour cream if desired.

Cream of Carrot Soup

Procedure: Follow general recipe for cream soup. Garnish with parsley.

Cream of Celery Soup

Procedure: Follow general recipe for cream soup. The celery may be finely chopped instead of being forced through a sieve, if desired. Garnish with minced parsley, water cress, chives or grated raw carrot.

Cream of Corn Soup

Procedure: Follow general recipe for cream soup. Use fresh grated corn or canned corn, cream style. To make purée: Use milk instead of water and cook 10 minutes in top of double boiler. The purée may be unstrained if desired. Garnish with strips of pimiento.

Cream of Lettuce Soup

Procedure: Follow general recipe for cream soup. Cook several slices of onion with lettuce. Season with nutmeg and a few drops lemon juice.

Cream of Mixed Vegetable Soup

Procedure: Follow general recipe for cream soup. To make purée: Diced raw

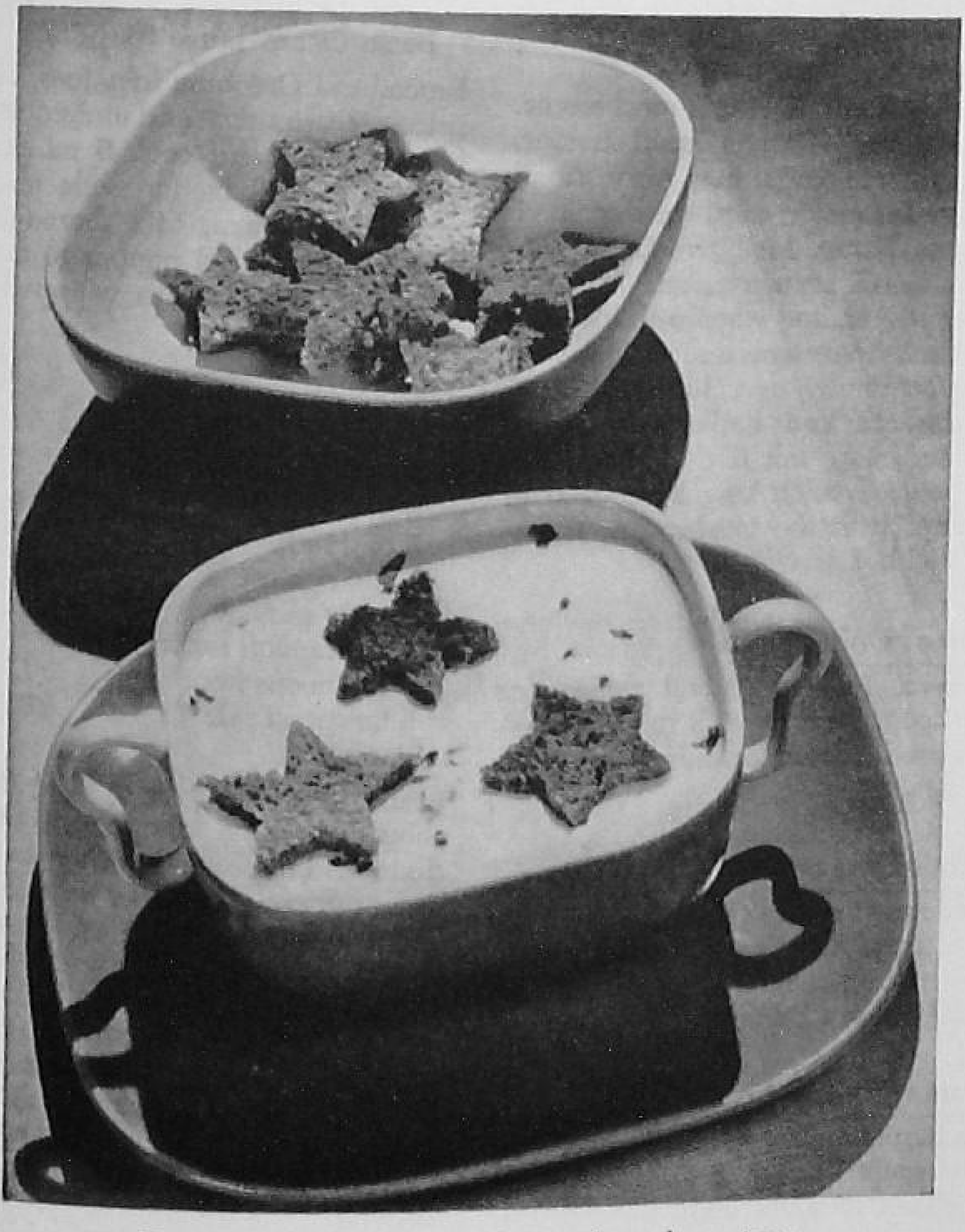

Fig. 116. Cream soup with star-shaped croutons.

vegetables such as potatoes, onions, carrots, celery and any leftover cooked vegetables such as peas, Lima beans, spinach or tomatoes may be cooked together and forced through a sieve. Garnish with minced parsley or grated raw carrot.

Cream of Mushroom Soup

Ingredients:

½ cup sliced mushrooms
½ cup water
2 tablespoons butter
2 teaspoons flour
¼ teaspoon salt
Dash pepper
½ cup milk

Procedure: Wash and stem mushrooms. Simmer stems in water until tender. Cut mushroom caps into very small pieces and simmer until tender in 1 tablespoon butter. Melt remaining butter in a small saucepan, stir in flour, salt and pepper, and when well blended stir in stock from stems and milk slowly, stirring constantly over low heat until soup thickens and boils. Add mushrooms and more salt if desired. A teaspoon minced onion may be cooked in the butter with the mushrooms, if desired. Yield: 1 serving.

Cream of Onion Soup

Procedure: Follow general recipe for cream soup. Garnish with minced parsley, grated cheese or minced roasted chestnuts.

Cream of Pea Soup

Procedure: Follow general recipe for cream soup. Add sugar and nutmeg to taste and garnish with paprika or minced cooked bacon.

Cream of Potato Soup

Procedure: Follow general recipe for cream soup. Garnish with minced parsley, chives or water cress.

Cream of Spinach Soup

Procedure: Follow general recipe for cream soup. Add sugar, nutmeg and a few drops lemon juice.

Cream of Tomato Soup

Ingredients:

¾ cup canned tomatoes
½ bay leaf
2 cloves
¼ teaspoon sugar
¼ teaspoon celery salt
1 slice onion
Speck baking soda
Dash pepper
Basic cream sauce (p. 563)

Procedure: Combine tomatoes, bay leaf, spices, seasonings and onion. Bring to boiling point and cook 5 minutes over low heat. Add baking soda and strain into cream sauce. Mix thoroughly and add more salt and pepper to taste. Reheat and garnish with whipped cream. Yield: 1 serving.

Oyster Bisque

Ingredients:

6 oysters
¾ cup milk
½ slice onion
1 sprig parsley
1 tablespoon butter
2 teaspoons flour
¼ teaspoon salt
Pepper

Procedure: Pick over oysters, drain and chop. Combine chopped oysters and drained liquor and bring to boiling. Press oysters and liquor through a sieve. Scald milk with onion and parsley and strain. Melt butter, stir in flour, salt and pepper, and when well blended add strained milk slowly, stirring constantly over low heat until mixture thickens and boils. Add oysters and more salt if necessary. Reheat and garnish with minced parsley or paprika. Yield: 1 serving.

Clam Bisque

Procedure: Follow preceding directions for oyster bisque, substituting clams for oysters.

STUDY QUESTIONS

1. Why may soup have an important place in the diet of the convalescent? Compare the contributions of a clear and a milk soup.

2. Distinguish between milk soups, chowders and stews.

3. Define a cream soup. What other terms are also used to describe cream soups?

4. Plan a luncheon or a supper using a clear soup and other dishes appropriate for serving with this type of soup.

5. Plan a luncheon or a supper which includes a cream soup.

Breads, Batters and Doughs

GRAIN FOR BREAD
COMMERCIAL VERSUS HOMEMADE YEAST BREADS
YEAST-BREAD STANDARDS
YEAST IN BREAD-MAKING
RECIPES USING YEAST BREAD AS A FOUNDATION
QUICK BREADS
BISCUIT AND MUFFIN RECIPES

Primitive man, perhaps in a lean season when animal food was scarce, added to the wild fruits which were his first source of vegetable food the wild grains which grew on the plain. Soon a primitive mill, made from two stones, ground them. They were then mixed with water and baked between the hot stones which he had learned to use as an oven after the discovery of the use of fire for cooking.

The first use of yeast as a leavening agent was probably accidental. A meal mixture left standing for a period before baking was found to be more palatable, and the story of bread-making—which has been of such importance in the story of mankind—was begun. The ancient Egyptians first developed bread-making in the modern sense. The art spread from them to their neighbors. The children of Israel in their captivity learned their method. Later the Greeks developed a fine bread, and according to history the Roman bakeries of later date were owned by Greeks.

The Romans introduced grains appropriate for bread-making into their colonies and built mills for grinding the flour. The cooks whom they took with them taught the natives their methods of bread-making. Later, when all the arts, including cookery, lapsed, yeast bread remained a staple food. Much of it was very coarse, and even the lord and the lady of the manor had white bread only on special occasions.

After the Renaissance, better grains and methods of milling were introduced. Yeast was the only leavening known until comparatively modern times. The "quick" breads, often known as "hot" breads, are seldom used to any extent in any country except the United States. Corn, or maize, was the only grain indigenous to this country, and it was prepared at first by mixing with water and baking in primitive fashion. Eventually, a form of leavening known as pearl-ash, a by-product of wood ashes, came into use. This was followed by commercial baking soda or saleratus, and later by baking powder. It was not until after the invention of the kitchen range a century or so ago that quick breads, in

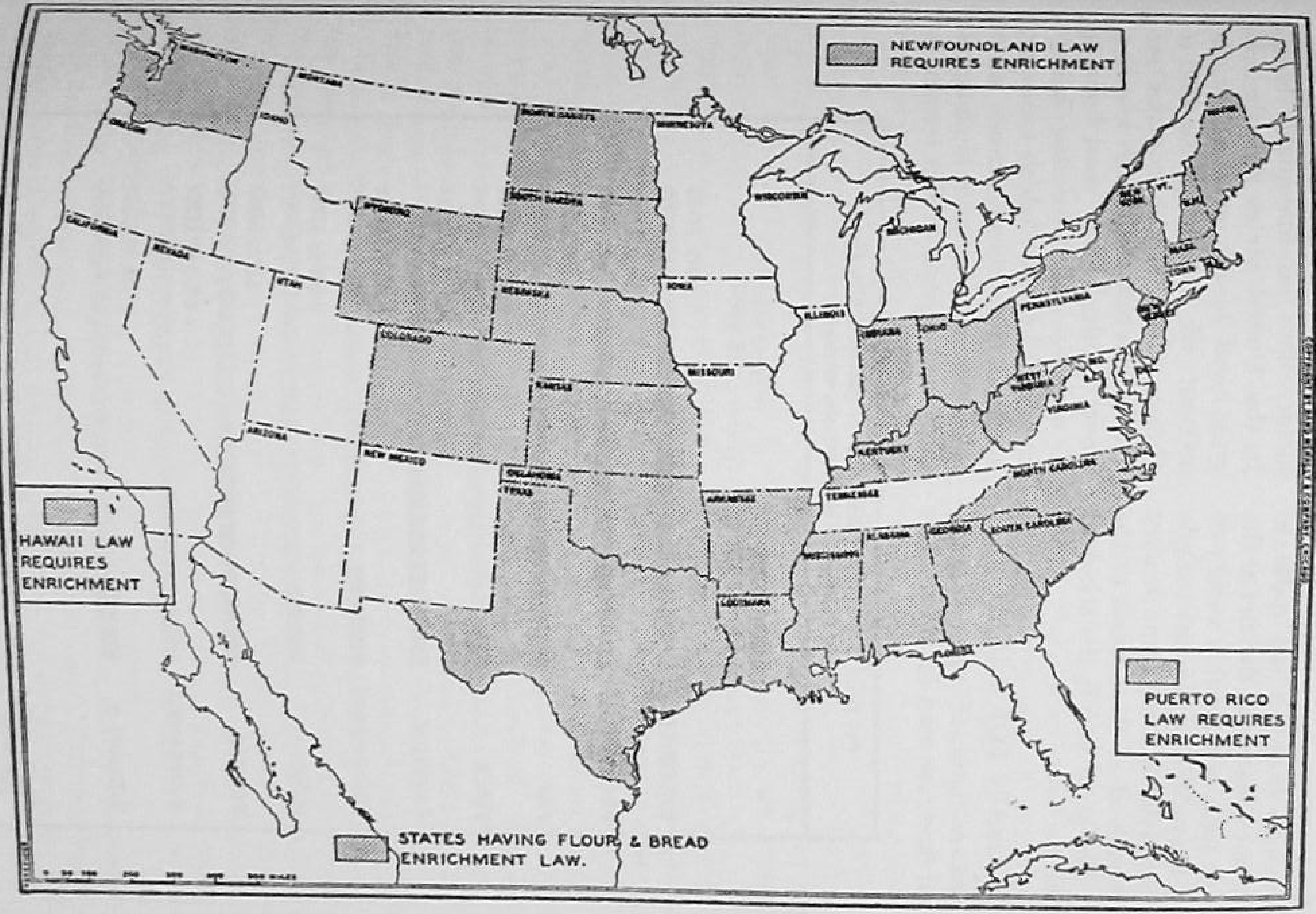

FIG. 117. Enrichment legislation map. (Food and Nutrition Board, National Research Council)

the modern sense, became a factor in the menu.

Although bread is not quite so important a feature of the diet at the present time, when such a variety of foods is available, it remains a staple and is served in some form in most households at all three meals of the day. The yeast loaf is the standard choice.

GRAIN FOR BREAD

Various types of ground grain, called flour, are used for bread. The experience of the ages has taught that wheat furnishes the most satisfactory flour for fine-quality bread. In the United States it is the only grain used to any great extent. On account of the large amount of gluten which wheat contains and which "develops" through kneading, wheat is ideal for a yeast bread. It is equally good for the baking-powder breads which are not kneaded. For these reasons wheat is considered the most important of the bread cereals in this country. In

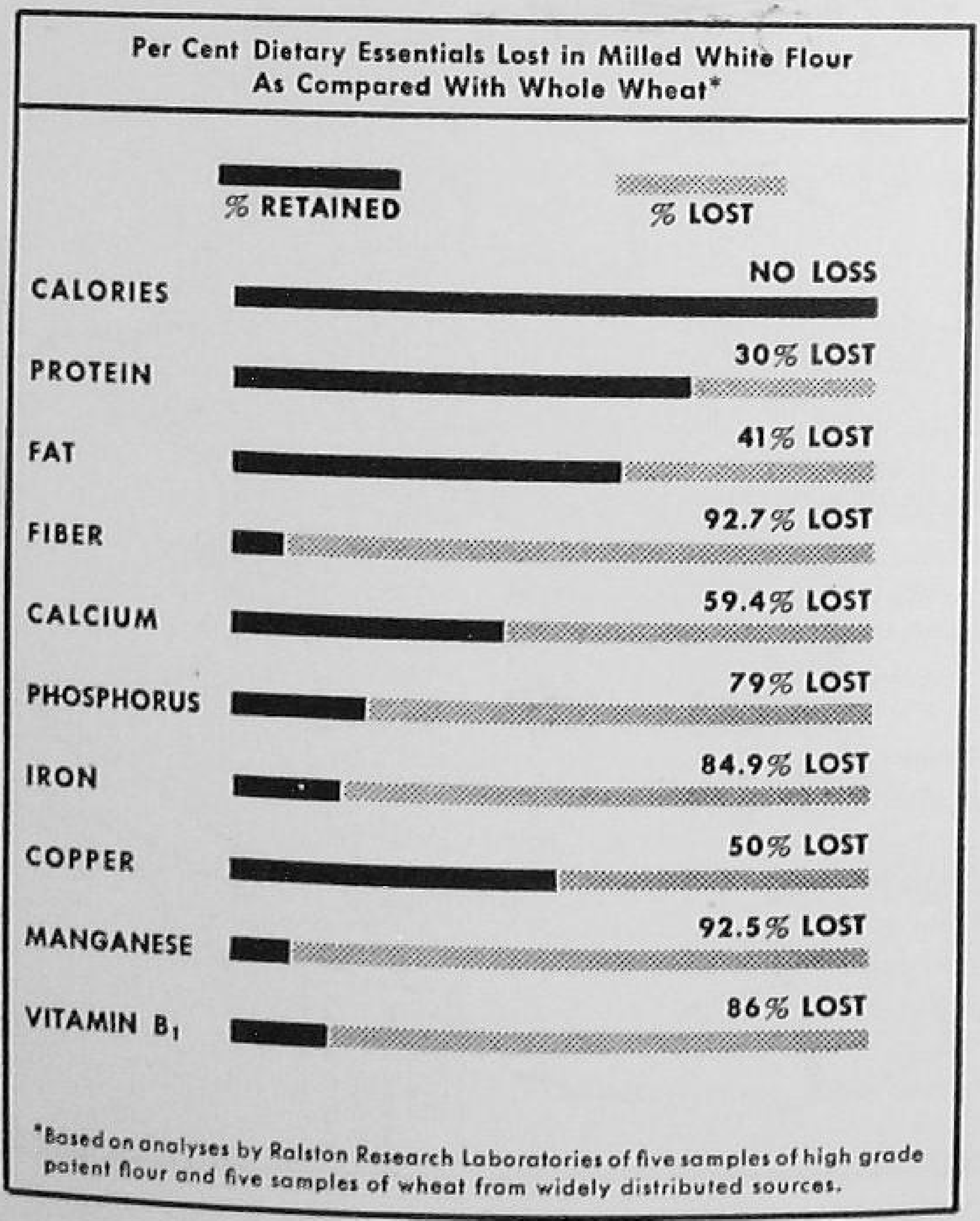

FIG. 118. Effect of milling wheat into white flour.

some European countries rye and barley are used largely. Rice is not used in bread-making, although it is used to larger extent than any other grain in the world, as half the world's population use rice as their staple food.

Whole and Milled Grains. In preparing cereals for bread-making the primitive machinery of our early ancestors merely crushed the grain. Later, the coarsest of the bran was removed. The modern roller-milling of wheat is a more complicated process, particularly designed to produce a pure white flour. Such flour contains none of the bran or germ and represents 70 per cent or less of the wheat kernel. The germ and the outer coatings of the wheat, which contain most of the minerals and the vitamins, are sold mostly for stock feed. A very small proportion of wheat is milled as whole-grain flour or manufactured into whole-grain or "bran" cereals. The taste, the appearance and the keeping quality of white flour and products made from it are largely responsible for the predominating use of this type of flour in this country.

In an effort to improve the nutritive value of the white loaf, which has become the bread of choice, a program for restoring flour and bread to nearly whole-grain value was initiated during World War II through the concerted efforts of nutritionists and the milling industry. Bread flour and all-purpose flour were enriched according to Federal specifications. Legislation was passed which made it obligatory for all bread made by commercial bakeries to be enriched for the duration of the war. In the following years, legislation has made enrichment mandatory in more than half of our states. In addition, a corn-enrichment program has been initiated in the Southern states (see Chap. 2).

Commercial bread may be enriched by the addition of minerals and vitamins or by the use of enriched flour. Study of Figure 118 shows the dietary essentials lost in milling white flour. A study of the chart, "Comparison of White Enriched and Whole-wheat Flour," shows the great improvement in nutritive value accomplished by the addition of thiamine, riboflavin, niacin and iron to white flour. This enrichment puts it about on a par as far as these factors are concerned with whole-wheat flour.

Some bakers add extra calcium to the mix for the dough or other substances that supply this mineral. A study, "The Calcium Content of Commercial White Bread," made by the U. S. Department of Agriculture,[1] shows, however, that bread cannot be depended upon for the same amount of calcium unless the label carries this information. The variability in calcium content from the analysis of 402 samples from 42 states and the District of Columbia is shown by the following quotation:

"White bread eaten at the city dweller's average weekly rate of 1½ pound loaves can supply as much as 16 per cent or as little as 1 per cent of calcium needs."

A number of bakers continue voluntarily to enrich their loaves, even when it is not obligatory in the states in which they distribute.

[1] Goddard, V. R., and Marshall, M. W.: U. S. Department of Agriculture, Technical Bulletin No. 1055.

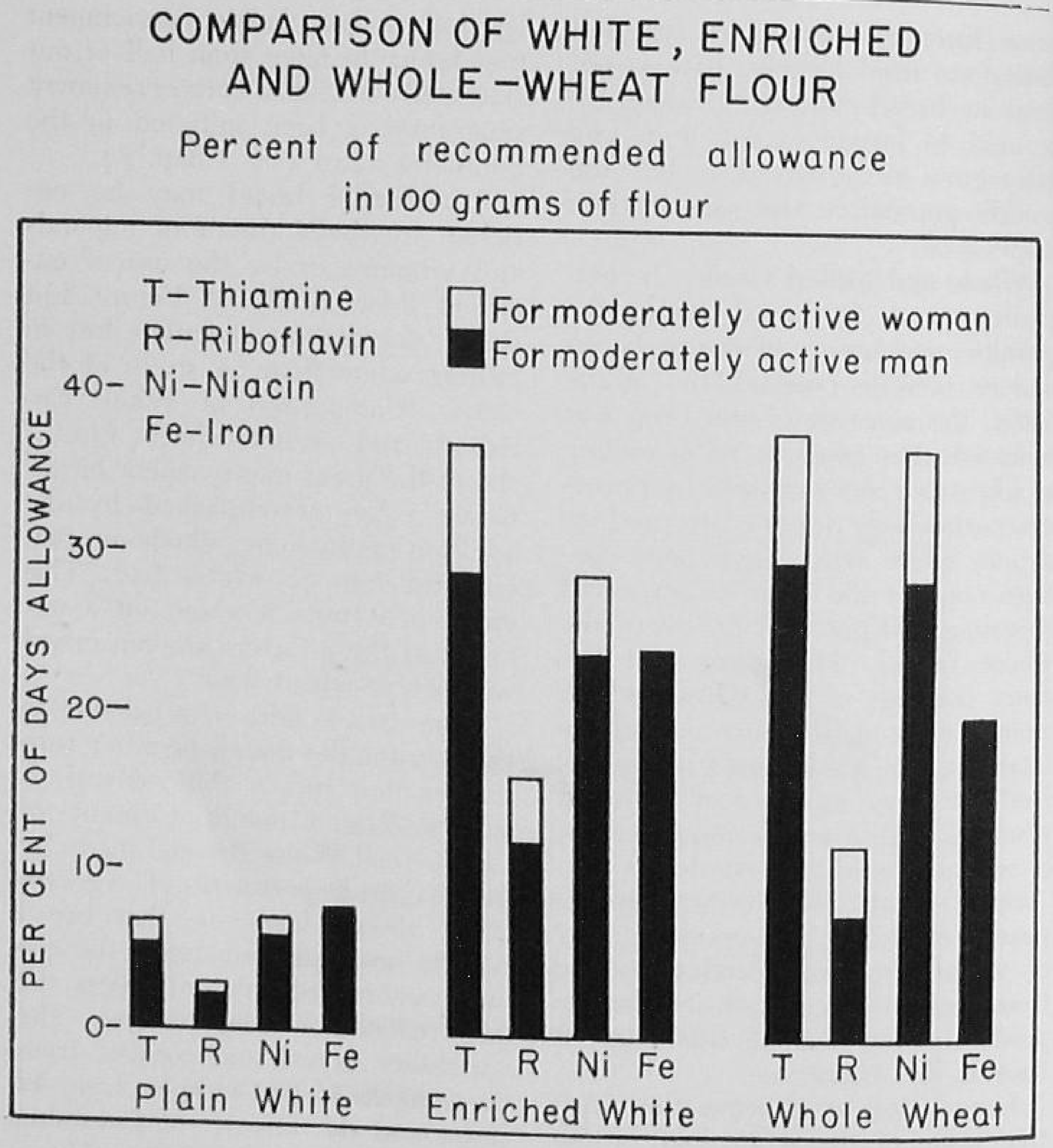

FIGURE 119

YEAST-BREAD STANDARDS

The United States Department of Agriculture has devised certain standards to which not only the homemade loaf but also the commercial product should conform in most respects. Because of the present custom of wrapping bakery bread, the crust is softer than that of a homemade or unwrapped loaf. There has been a trend toward a softer crumb than that supplied by a homemade loaf. French and Italian bread and other typical foreign breads which have a crisp crust are not wrapped. As these breads generally are made with water rather than with milk, and as no shortening is used, the nutritive contribution

FIG. 120. Loaves of bread showing effect of milk on texture and appearance. Loaf 1 was made with water, Loaf 2 with whole skimmed milk, Loaf 3 with powdered milk. Note the improvement in the general appearance of the whole loaf and the better texture in 2 and 3. This is due to the use of milk. Milk has the further advantage of increasing the nutritive value of the bread. (University of Illinois)

may be less than that of the standard loaf. Further, they become stale more quickly. However, they are chosen by some because of their special flavor and crisp crust. Special types of loaves made with eggs, extra shortening and sometimes sweetened with honey, have been offered to meet the demand for what is considered a homemade type of loaf. They are sold at a higher price and have a limited but growing distribution. Many of the large commercial bakers offer loaves of rye, gluten, whole-wheat and sometimes cracked-wheat and other types in addition to the standard loaf.

YEAST IN BREAD-MAKING

Compressed yeast which was customarily used for bread made in home kitchens has been generally superseded by dry, granular yeast. This is an advantage because, packed as it is in foil bags, it will keep for several months without refrigeration. It is necessary to keep compressed yeast in the refrigerator and to use it within a few days after purchase. The type of granular yeast

now on the market has a quicker action than that formerly offered, and results are as good as when the compressed product was used. In whatever form yeast is used, it contains millions of living organisms which reproduce rapidly when given food in the form of sugar (or starch, which is convertible into sugar), a suitable temperature and moisture. The generally available yeasts on the market are pure and begin to act when provided with the above necessities. Much more consistent results are obtainable when the present standardized yeasts are used than when our grandmothers made yeast at home by allowing the wild yeast plants to ferment potato water or flour and water.

Baking. In bread-making, care must be taken to give the yeast plants the proper temperature for action, between 70 and 95° F. A much higher temperature will kill the plants, and a low temperature will retard their growth. Yeasts use ordinary sugars readily, and for this reason a little sugar is added to the sponge. Moisture is furnished by the liquid with which the flour is mixed. A good recipe for bread will cover all these points. When yeast is active, carbon dioxide and alcohol develop in the dough. Carbon dioxide is the gas which raises the bread. The alcohol must be driven out by heat to prevent what is known as the yeasty taste. Bread baked sufficiently at a high enough temperature will be free from this flavor. Recent experimentation has shown that proper baking will dissipate the alcohol, however large an amount of yeast is used. Thus it is possible to increase the amount of yeast inversely with the time required for rising and obtain just as good results. The extra cost of the large amount of yeast for quick-process bread means a saving of time and therefore may be worth while.

RECIPES USING YEAST BREAD AS A FOUNDATION

Sliced bread is often used for toast and may be thick or thin according to preference. For Melba toast, thinly sliced bread must be used. For croutons, either thick or thin bread may be used. For sandwiches of the luncheon or picnic type, thick slices are usually preferred, while for tea sandwiches the thinner slices are desirable. Bread crumbs, both soft and dry, are used as a topping or a coating for other foods. They are also used to make a stuffing for fowl and other meats.

Toast Recipes

Toast

Procedure: For toast which is to be served as an accompaniment at breakfast or another meal, bread should be in slices from ¼ to ½ inch thick, depending upon the preference of the patient. The crusts may be trimmed if desired before toasting in the broiling oven of the gas or electric stove, or in the electric toaster. The last may be used in the patient's room. Bread should be toasted on both sides until golden brown, and unless dry toast is preferred by the patient or ordered by the doctor, it should be buttered as soon as it is made. Buttered toast should never be put under the heat of the broiler. If it cannot be served immediately, it may be kept warm by the retained heat of

FIG. 121. Open-face sandwiches, cottage cheese, bacon and tomato.

the broiling oven after the heat has been turned off. Toast made in the kitchen should be wrapped in a napkin to keep it as hot as possible.

Melba toast is made from thinly sliced bread and should be baked in a very slow oven (250° F.) until golden brown. It may be served hot or cold, and is often ordered for the invalid diet.

Milk Toast

Ingredients:

1 cup milk
⅛ teaspoon salt
2 slices buttered toast

Procedure: Heat milk in double boiler, add salt. Serve in heated pitcher with toast arranged in a hot cereal bowl. Pour milk over 1 slice of toast at a time when serving. Cream may be substituted for half the milk. Yield: 1 serving.

Cream Toast

Ingredients:

1 tablespoon butter
1 tablespoon flour
½ teaspoon salt
1 cup milk
2 slices buttered toast

Procedure: Melt butter in a small saucepan, stir in flour and salt, stir in milk gradually and continue stirring over low heat until sauce thickens and boils. Pour at once over buttered toast. Garnish with minced parsley or paprika. Yield: 1 serving.

Cheese Toast

Procedure: Follow preceding directions for cream toast. After sauce has thickened, add ¼ cup grated cheese, stir until melted and pour over toast.

Cream Tomato Toast

Procedure: Follow directions for cream toast (p. 575), substituting ¼ cup strained cooked tomatoes for ¼ cup milk. If seasonings are allowed, cook 1 slice onion, a bit of bay leaf and 2 cloves with the tomatoes. Pour over buttered toast.

Cinnamon Toast

Procedure: Sprinkle hot buttered toast with mixed sugar and cinnamon. Allow ¼ teaspoon cinnamon and 1 tablespoon sugar for each slice of toast.

Special Cinnamon Toast

Ingredients:
- 2 slices bread
- 1 tablespoon butter
- 2 tablespoons sugar
- ¼ teaspoon cinnamon

Procedure: Trim crust from sliced bread; cream butter, sugar and cinnamon. Spread on bread and cut in finger lengths. Bake in moderate oven (350° F.) from 10 to 12 minutes (until slightly brown). Yield: 1 serving.

Croutons

Procedure: Remove crusts evenly with a long, sharp knife from sliced bread; reserve crusts for dry crumbs. Cut bread into cubes or fancy shapes and bake in a moderate oven (325° F.) or brown lightly in butter in a small frying pan. Stir occasionally with either method.

Croustades

Procedure: Cut a slice of bread 2 x 3 inches from loaf. Trim crust evenly and remove enough crumb from center to form a box. Brush with melted butter and bake in moderately hot oven (400° F.) until brown and crisp.

Toast Water

Ingredients:
- 3 slices Melba toast
- 1 cup boiling water
- Salt

Procedure: Break toast into small pieces and pour boiling water over it. Let stand for 1 hour, strain, add salt and serve hot or cold. If desired, a teaspoon of wine or cream and sugar to taste may be added. Toast water is usually given, however, to postoperative or very sick patients who can take only the slightest amount of nutriment, and it is therefore usually served plain. Yield: 1 serving.

Toasted crackers may be used in place of Melba toast.

Preparation of Crumbs

Fine Dry Crumbs

Procedure: Dry crusts or bread slices in slow oven until crisp enough to roll. Place on towel, fold over and crush with rolling pin.

Soft Crumbs

Procedure: Use bread one day old or more, but not dried out. Rub slices together or grate, discarding crusts. Three slices of bread ½ inch thick will make about 1 cup crumbs.

Sandwiches

General Directions

When a sandwich is to serve as the main luncheon dish, sliced bread or bread cut ½ inch thick may be used. For dainty sandwiches to serve with salads or with tea, thinly sliced bread should be used. Canapés, which are merely open sandwiches, usually garnished attractively, may replace the thin filled sandwiches. If loaf bread is used, a long thin knife, preferably with a saw edge, should be chosen and kept abso-

lutely vertical while the loaf is cut, in order that slices may be of even thickness. Bread a day old will slice more easily than fresh bread. Unless sandwiches are to be toasted, the bread should not be purchased more than a day ahead. Butter should be allowed to soften at room temperature, but should not be melted. If not quite soft enough to spread, it may be worked with a stiff knife with a rounded end until the desired consistency is reached.

For the invalid's tray, the crusts are usually removed from the bread for luncheon, supper and tea sandwiches. This should be done evenly with a comparatively long sharp knife, and it is easier to do after the sandwiches are filled. For this reason, filling should not go completely to the edge; this avoids waste. If the patient likes crusts, they should be left on the bread. Bread is often toasted, sometimes on both sides and sometimes on one side, for luncheon or supper sandwiches before they are filled. Dainty sandwiches may be toasted after filling.

When chicken, fish, cheese or peanut butter is used as the main ingredient of the filling, sandwiches may sometimes serve as meat alternates, and even the dainty sandwiches may be counted upon to add somewhat to the protein content of the diet. When salad greens are included with the sandwich filling, they should be crisp. If shredded, they are easier to eat. Luncheon or supper sandwiches should be cut into strips, either lengthwise or diagonally, unless they are to be served "open face," when they will be eaten with a fork. For these, spreads contrasting in flavor and in color may be used. Well-seasoned cottage cheese, for instance, may be spread on one slice of bread or toast, while bacon and tomatoes may be used on the other.

Luncheon or Supper Sandwiches

Chicken or Turkey Sandwiches

Procedure: Thinly sliced chicken or turkey between slices of buttered bread is often preferred to a chopped filling for a luncheon or a supper sandwich. This may be seasoned merely with salt and pepper. Crisp lettuce may be placed on top of the meat and spread with mayonnaise.

Procedure: Chopped chicken or turkey may be mixed with mayonnaise and seasoned with a small amount of onion if allowed and liked. For a salad sandwich, the meat should be chopped coarsely and combined with celery as well as mayonnaise. For a minced chicken or turkey sandwich, the meat may be finely ground or chopped, or a chicken or turkey paste may be used.

Meat Sandwiches

Procedure: Use directions for chicken or turkey sandwiches. Chili sauce or catsup may replace the mayonnaise.

Fish Sandwiches

Procedure: Cooked or canned salmon, tuna fish, lobster, crabmeat or flaked shrimp may be used. For 1 sandwich allow ⅓ cup fish, 2 tablespoons minced celery and mayonnaise to moisten.

Cream or Cottage Cheese Sandwiches

Procedure: As filling for a luncheon sandwich, use ½ cake cream cheese or ¼ cup cottage cheese. Add sweet or sour cream if necessary to soften enough to spread. Minced olives, chopped nuts, chives or minced onion and parsley may be mixed with the cheese.

Peanut Butter Sandwich

Procedure: For one sandwich, use from 2 to 3 tablespoons peanut butter. If too thick to spread, moisten with cream or milk or with chili sauce or catsup, which will add flavor. Serve between slices of buttered bread, or bread toasted on one side only. If desired, toasting may be done after sandwich has been filled. A tart jelly may be spread on top of the peanut butter if desired.

Peanut Butter and Bacon Sandwich

Procedure: Mix 2 tablespoons peanut butter with 1 tablespoon cream or chili sauce. Mince 1 strip cooked bacon and mix with peanut butter. Spread on 1 slice hot buttered toast or on 2 buttered halves of finger roll. The latter may be put under the broiler for 2 minutes if desired.

Salad Sandwich Roll

Procedure: Split a soft finger roll and spread with softened butter. Pile chicken, crab or shrimp salad on each half. Garnish with strips of green pepper or pimiento, or with hard-cooked egg yolk which has been put through a seive. One half of the roll may be piled with chicken or fish salad and the other half with creamed butter mixed with deviled ham or anchovy paste.

Bacon and Tomato Sandwich

Procedure: Toast 2 slices bread and trim crusts. Put 1 slice on warm plate, cover with crisp lettuce and thick slices of skinned tomatoes. Arrange crisp bacon on top of tomatoes and cover with other slice of toast. Cut diagonally into 3 sections. The tomatoes may be spread with mayonnaise if desired.

Cheese Dream

Procedure: Toast 1 slice bread on one side. Trim crust and butter untoasted side. On this arrange thin slices of American cheese. Sprinkle with paprika and spread with prepared mustard if desired. Place under broiler about 3 inches from heat and toast until cheese melts. Minced uncooked bacon or 2 strips of bacon may be placed on top of cheese before it is toasted. Serve with sliced skinned tomatoes if desired.

Club Sandwich

Procedure: Toast 3 slices of bread lightly, trim edges evenly with long sharp knife and spread with butter. On the first slice arrange leaves of crisp lettuce and slices of cooked chicken. Spread with mayonnaise and cover with second piece of toast. On this arrange sliced tomatoes. Spread tomatoes with mayonnaise and top with broiled bacon. Cover with third slice of toast and cut diagonally into 3 sections. Garnish with lettuce and stuffed olives.

Grilled Sardine Sandwich

Procedure: Toast 1 slice bread on one side and trim crust. Arrange drained sardines on untoasted side, place under broiler about 3 inches from heat and toast about 3 minutes until sardines are thoroughly heated. Place on warm plate and sprinkle with lemon juice or serve with a lemon quarter.

Hot Mushroom Sandwich

Procedure: Use 2 slices buttered bread or 2 slices buttered toast. Trim crusts. Put 1 slice bread or toast on warm plate and cover with creamed mushrooms (p. 547). Cover with other slice and garnish with parsley or with sliced hard-cooked egg.

Tea Sandwiches

Softened butter, cream cheese or a meat paste is generally the basis of filling for dainty sandwiches. The thinly sliced bread may be spread with softened butter or with cheese.

The butter and the cream cheese may be flavored with minced water cress plus a little lemon juice and onion juice, if allowed. Anchovy paste may also be used as a flavoring. Cream cheese may be thinned with sweet or sour cream and flavored with minced olives or chopped nuts. The meat paste should be thinned with sweet or sour cream and may be seasoned to taste. The spread slices of bread may be covered with unspread slices if desired and cut with a sharp knife into squares or diamonds or with a fancy cutter. Open sandwiches, or canapés as they are called, may be garnished with sliced hard-cooked eggs, sliced olives or strips of pimiento or green pepper, if allowed. The spread slices, after the crusts have been trimmed evenly, may be rolled and then fastened with a toothpick and garnished at the end with sprigs of parsley or water cress.

QUICK BREADS

The leavening or the raising of dough can be produced by the combination of an acid with an alkali, sodium bicarbonate or baking soda. This action is quite fast, and for that reason is used in the preparation of doughs and batters for quick breads such as muffins, griddle cakes, biscuits, cakes and cookies. Molasses and soda or sour milk and soda are used for certain products, but baking powder is more widely used.

The acid-reacting materials used in baking powders are: (1) Tartaric acid and its salt, commonly known as cream of tartar. Such powders are classified as tartrate powders. (2) Acid salts of phosphoric acid which give the powders the name of phosphate. (3) Compounds of aluminum. The aluminum compound used at present is sodium aluminum sulfate. The manufacturers have designated this powder by the initials of the acid salt S.A.S. (4) Combinations of any of the above acid ingredients. The combination most frequently used is that of (2) and (3). This combination powder is frequently designated as S.A.S. phosphate, and is commonly known as "double-acting" baking powder.

The chief difference between these powders is the reaction time in the cold. The tartrate powders react very quickly with the production of the carbon dioxide gas. Therefore, the mixtures containing them should not be beaten after the ingredients are thoroughly mixed, since the beating tends to drive out the gas. This is especially true of thin mixtures.

The aluminum salt S.A.S. is relatively insoluble in the cold dough or batter and requires heat to produce complete action. Mixtures containing this type of powder may well be beaten longer than when tartrate powders are used, and if it is desirable they may be allowed to stand from 10 to 15 minutes at room temperature before baking. The phosphate is more soluble than the aluminum salt, but less soluble than the tartrate. It is intermediate in its reaction time.

There was at one time much discussion in regard to the wholesomeness of various baking powders, especially those containing aluminum compounds. Well-known scientists

differed in opinion as to the effect of the residue from aluminum compounds upon health. Later research work with this type of baking powder, however, has resulted in confirmation of the theory that aluminum salts in the quantities in which they are usually found in breadstuffs are harmless. As baking powders of this type are inexpensive, they are used largely today. When a combination powder replaces a baking powder of another type in a recipe, about one third less should be used.

Baking-powder mixtures will in any case figure only slightly in the diet of the invalid. Bran, whole-wheat and gluten muffins are the only baking-powder breads used to any extent. When baking-powder mixtures are used, they should be baked thoroughly.

Other Methods of Raising Batters. The raising of batter may be done by air and steam. Sponge cakes and angel cakes, which contain no chemical leavening agents, are raised by the expansion of the air beaten into the thin batter, and also by the steam generated from the heating of the water in the mixture. Steam plays the principal part in raising preparations which are made from thin batter—so thin that it allows the force of the steam to raise it.

Doughs and Batters. A mixture of flour and other ingredients combined with just enough liquid so that the dough may be rolled is known as a dough, while a thinner mixture is known as a batter. The latter usually contains eggs. Biscuits, cookies and pastry are examples of doughs; griddle cakes, muffins, popovers and waffles are examples of batters. All-purpose flour is the choice for doughs and for all batters excepting fine cake, for which a highly refined cake flour is preferable.

To obtain a tender texture, both doughs and batters should be handled as little as possible. Doughs should be rolled only enough to produce the proper thickness; batter should be stirred just enough to moisten the dry ingredients thoroughly.

Recipes for biscuits and muffins of the standard type follow. Additional recipes for biscuits and muffins and for cookies and cakes will be found under "Allergy Recipes," Chapter 50.

BISCUIT AND MUFFIN RECIPES

Biscuits and muffins, often known as quick breads, are easy to prepare. Because of the comparatively small amount of shortening used in their preparation, both dough and batter must be handled gently if the products are to be tender. When liquid is added to the dry ingredients, there should be no overstirring or beating. Muffin batter need not be free from lumps to produce a standard product that is light with a fluffy tender crumb free from large holes. Biscuit dough should be kneaded lightly just long enough to smooth it in order to obtain a light, tender product.

Both biscuits and muffins should be served as soon as possible after they come from the oven and should be arranged in a napkin for serving. Leftover products may be reheated in a roll warmer in the oven, if they

FIG. 122. Mixing bran muffins.

are covered, or they may be split and toasted.

Baking Powder Biscuits

Ingredients:

1 cup sifted flour
1½ teaspoons baking powder
¼ teaspoon salt
2 tablespoons shortening
⅓ cup milk (about)

Procedure: Mix and sift the dry ingredients together. Work in the shortening with tips of fingers or cut in with 2 knives. Add the liquid all at once, mixing with a knife gently until flour is dampened. Then stir quickly just until dough follows knife round bowl (about 30 strokes altogether). Pat or roll to ½ inch in thickness. Cut into rounds with a biscuit cutter. Press trimmings together lightly, pat or roll and cut into rounds. Place on ungreased baking sheet and bake in a hot oven (450° F.) from 12 to 15 minutes. Yield: 8 biscuits.

Drop Biscuits

Procedure: Follow directions for baking powder biscuits. Increase milk to ½ cup and omit kneading. Drop by tablespoonfuls on ungreased baking sheet.

Muffins

Family-size recipes for muffins demand only one egg. For this reason and because a large number of muffins may be baked as easily as a small number, it is well to prepare large recipes if the other members of the family besides the patient like hot breads. For a small recipe, beat egg before dividing into equal halves. The remaining half may be used for some other purpose in cooking. Both family-size and small-quantity recipes are given for muffins.

Plain Muffins

Family Size

Ingredients:
- 2 cups sifted flour
- 3 teaspoons baking powder
- 2 tablespoons sugar
- ½ teaspoon salt
- 1 egg
- 2 tablespoons melted shortening
- 1 cup milk
- Yield: 16 small muffins

Small Quantity

Ingredients:
- 1 cup sifted flour
- 1½ teaspoons baking powder
- 1 tablespoon sugar
- ¼ teaspoon salt
- ½ egg
- 1 tablespoon melted shortening
- ½ cup milk
- Yield: 8 small muffins

Procedure: Mix and sift the dry ingredients. Beat egg thoroughly and stir in melted shortening. Add milk and stir well. Stir this mixture all at once into the dry ingredients until they are just moist (about 15 strokes). Drop into greased muffin pans and bake in hot oven (425° F.) about 20 minutes if small muffin pans are used, from 25 to 30 minutes if large pans are used.

Corn-Meal Muffins

Procedure: Follow directions for plain muffins below. For Family-Size Recipe: Combine 1 cup sifted white flour with ¾ cup corn meal. For Small-Quantity Recipe: Combine ½ cup sifted white flour with ⅜ cup corn meal.

Whole-Wheat Muffins

Procedure: Follow preceding directions for plain muffins. For Family-Size: Combine 1 cup sifted white flour with the other dry ingredients and sift together. Add ¾ cup unsifted whole-wheat flour to this mixture.

For Small Quantity: Combine ½ cup sifted white flour with the other dry ingredients and sift together. Add ⅜ cup unsifted whole-wheat flour to this mixture.

Rich Muffins

Family Size

Ingredients:
- 2 cups sifted flour
- 3 teaspoons baking powder
- ½ teaspoon salt
- ¼ cup shortening
- ¼ cup sugar
- 1 egg
- 1 cup milk
- Yield: 16 small muffins

Small Quantity

Ingredients:
- 1 cup sifted flour
- 1½ teaspoons baking powder
- ¼ teaspoon salt
- 2 tablespoons shortening
- 2 tablespoons sugar
- ½ egg
- ½ cup milk
- Yield: 8 small muffins

Procedure: Mix and sift dry ingredients. Cream shortening, add sugar and cream until fluffy. Stir in egg. Add dry ingredients alternately with milk, beating well after each addition. Bake in greased muffin pans in moderately hot oven (425° F.) from about 20 to 30 minutes.

Sally Lunn

Procedure: Follow preceding directions for rich muffins. Pour batter into a greased cake pan 8 inches square. Sprinkle with ¼ cup sugar mixed with 1 teaspoon cinnamon. Bake in a moderate oven (375° F.) 30 minutes.

Bran Muffins

Family Size

Ingredients:
- 2 tablespoons shortening
- ¼ cup sugar
- 1 egg
- 1 cup bran
- ¾ cup milk
- 1 cup sifted flour
- 2½ teaspoons baking powder
- ½ teaspoon salt
- Yield: 16 muffins

Small Quantity

Ingredients:
- 1 tablespoon shortening
- 2 tablespoons sugar
- ½ egg
- ½ cup bran
- ⅜ cup milk
- ½ cup sifted flour
- 1¼ teaspoons baking powder
- ¼ teaspoon salt
- Yield: 8 muffins

Procedure: Cream shortening and sugar thoroughly. Add unbeaten egg and beat well. Stir in bran and milk. Let soak until most of moisture is taken up. Add sifted dry ingredients and stir only until flour disappears. Bake in greased muffin pans in moderately hot oven (400° F.) about 30 minutes.

STUDY QUESTIONS

1. Outline the use of grain in bread through history to the present day.

2. Why is wheat the chosen flour for a yeast bread? Why was refined white flour used as a staple ingredient?

3. What additions to refined flour were obligatory during World War II? Should this program be continued?

4. Compare the relative amounts of various nutrients in white, in enriched and in whole-wheat flours.

5. What leavenings are used for raising quick breads? Give examples of their use.

6. How does a dough differ from a batter? How should each be handled so that the texture will be fine?

Inexpensive Family-Size Recipes

SOUPS
MEAT DISHES
CHEESE DISHES
MISCELLANEOUS MAIN DISHES
FISH DISHES
DESSERTS
THE USE OF DRY SKIM MILK
SPECIAL RECIPES

The public-health nurse may find it necessary to help a family to utilize the food budget in such a way that food will be adequate. When a nutritionist is attached to the staff of the public agency with which the nurse works, a menu and recipe service will be available for distribution. As all social agencies do not have the advantage of the services of nutritionists, inexpensive family-size recipes are given in this chapter. The following group of recipes can be suggested by the nurse to families in need of low-priced nutritious foods. The ingredients of the recipes have been chosen with due regard for cost. Evaporated milk, for instance, is generally less expensive than fresh milk. Dry skim milk, although a comparatively new product, is in general distribution. As not all families are familiar with it, and as it is the most inexpensive form of milk, it may be important to demonstrate the way it should be used. Directions for methods, accompanied by special recipes for its use, are therefore included in this chapter (see p. 596). Suggestions for the selection and the preparation of inexpensive cuts of meat and the use of fish when it is low in price may be of help when the food budget is limited. See Chapter 10 for additional suggestions on economical food selection and menu planning.

Kitchen equipment often is limited, and dishes which can be made with utensils on hand should be chosen. If an oven is not available, dishes which can be cooked on top of the stove should be suggested. In the absence of a measuring cup, an 8-ounce glass may be used.

Another factor, and one of great importance, that must be considered is the customary food pattern of the family. This may be based upon national or regional customs that in many respects may be adequate although different from the common American choice of foods. A comparison of the main dishes typical of twelve different countries, compiled by the Food and Nutrition Section, Welfare and Health Council, New York City, exemplifies this fact. A number of the following recipes for main dishes were distributed during the annual Nutrition Week sponsored by this organization.

FOOD CUSTOMS

Area	Country	Main Dish	Ingredients
North America	U. S. A.	Beef stew	Beef, carrots, onions, potatoes
	Mexico	Chili con carne	Chopped beef, onions, green peppers, beans, tomatoes, fat
South America and Caribbean	Brazil	Gzzadino	Beef, carrots, onions, tomato, celery
	Cuba	Picadillo Cubana (Cuban hash)	Ground beef and pork, onions, green peppers, capers, tomato paste, olives, raisins
Europe	England	Steak and kidney pie	Round steak, kidneys, onions, beef stock, flour, pie crust
	Denmark	Frikadeller (meat balls)	Ground beef and pork, flour, potatoes, eggs, onions, milk
	Poland	Zraziki Po Krakowsku (beef roll-ups)	Round steak, onions, bread crumbs, flour, egg, butter
Africa	Egypt	Eggplant and ground beef casserole	Ground beef, onion, eggplant, butter, tomato sauce
	Liberia	Perleau rice	Chicken, tomato paste, brown rice, onions, ham, cabbage, flour, fat
Near East	Israel	Fish soup	Mixed fish, onion, oil
Far East	India	Chicken curry	Chicken, onions, tomato, green pepper, butter, cottage cheese
	China	Lot Tsu Fan Kare Ngou Yuk (beef with peppers and tomatoes)	Beef, green peppers, tomatoes, cornstarch

SOUPS

Bean Soup

Ingredients:

1½ cups navy beans
½ cup diced carrot
2 medium-sized onions, sliced
2 bay leaves
6 cups boiling water
½ cup milk, about
Salt
Pepper

Procedure: Soak beans 12 hours and drain. Put beans, vegetables, bay leaves and water in saucepan. Cover and simmer over low heat until beans are soft, about 2 hours, stirring occasionally to prevent burning. Force through a sieve. Add enough milk to desired consistency. Season with salt and pepper. Reheat

and serve. Yield: 6 generous servings.

NOTE: A meat bone, if one is on hand, may be cooked with the beans. Peas and lentils may be used in place of the beans. They may be cooked without soaking if directions on package so state.

Milk Vegetable Chowder

Ingredients:

- 4 tablespoons butter or other fat
- 1 medium-sized onion, sliced
- 3 cups mixed diced vegetables (potatoes, celery, carrots)
- 2 cups boiling water
- 2 cups milk or 1 cup evaporated milk diluted with 1 cup water
- Salt, pepper

Procedure: Melt butter, add onion and cook 3 minutes. Add vegetables and cook 3 minutes, stirring constantly over low heat. Add water and cook until vegetables are tender. Stir in milk slowly and heat. Season to taste with salt and pepper. Yield: 6 servings.

NOTE: Cooked leftover vegetables may replace part of the fresh vegetables and should be added with the milk.

Fish Vegetable Chowder

Procedure: Use recipe for milk vegetable chowder. Reduce amount of diced vegetables 1½ cups and add from ½ to ¾ lb. cut boned fish. Leftover cooked fish may be used if it is added when the vegetables are almost tender.

MEAT DISHES

Goulash

Ingredients:

- 1 lb. stewing beef
- ½ lb. lean pork
- 2 pig or lamb kidneys
- 4 tablespoons bacon fat
- 3 tablespoons minced onion
- 1 cup canned tomatoes
- 1 teaspoon salt
- ⅛ teaspoon pepper
- 4 medium-sized potatoes, pared and cut in cubes

Procedure: Cut meat in 1-inch cubes and split kidneys. Remove membrane and tubes from kidneys, soak in salted water 30 minutes and slice. Heat bacon fat in heavy frying pan, add onion and meat, and sauté until onions and meat are brown. Add tomatoes, salt and pepper, and mix well. Cover and let simmer slowly 1 hour. Uncover, add potatoes, cover and cook until potatoes are tender. Add a little water and more salt if necessary. Yield: 6 servings.

Liver, Sautéed

Procedure: Have beef, lamb or pork liver sliced ½ inch thick. Wipe with cloth and remove skin and tubes. Dredge with flour. Cook in hot, well-greased frying pan about 5 minutes, turning occasionally until well browned. Add more fat as needed. Season with salt and pepper. Be careful not to overcook liver. Allow ¼ lb. for each serving.

Baked Liver with Vegetables

Ingredients:

- 1 lb. beef liver, sliced
- 1 teaspoon salt
- ¼ teaspoon pepper
- 4 onions
- 2 carrots
- 2½ cups canned tomatoes

Procedure: Wipe liver, season with salt and pepper. Roll in flour. Cut onions and carrots in small pieces, put in frying pan, add sliced liver and canned tomatoes. Cover. Bake in moderate oven (375° F.) or cook over low heat on top of stove about 30 minutes (until liver is tender). Add more seasoning, if necessary. Yield: 6 servings.

Meat Loaf

Ingredients:

- 1 cup soft bread crumbs
- ½ cup milk or water
- 1 lb. chopped beef
- 1 egg (may be omitted)
- 1 onion, finely chopped
- 1 teaspoon salt
- ⅛ teaspoon pepper

Procedure: Soak bread crumbs in milk. Add other ingredients and mix well. Place in greased baking pan and bake in moderate oven (375° F.) 30 minutes, or until brown. A chopped carrot or green pepper may be added, if desired. Yield: 6 servings.

Meat Stew

Ingredients:

- 2 lbs. stewing beef or lamb
- 1 teaspoon salt
- ⅛ teaspoon pepper
- 7 onions
- 4 cups boiling water
- 1 bay leaf
- 4 cloves
- 6 carrots
- 6 potatoes
- ¼ cup flour

Procedure: Wipe meat and cut in 1-inch pieces. Sprinkle with salt and pepper and brown in its own fat. Peel and slice 1 onion; cook with meat until yellow. Add water, bay leaf and cloves, cover and cook over low heat 1½ hours. Add scraped carrots and remaining peeled onions; cook ½ hour. Add peeled potatoes and cook until potatoes are tender. Mix flour with cold water to a smooth paste and stir into stew. Add more salt if necessary. Stir until gravy begins to thicken. Yield: 6 liberal servings.

NOTE: The carrots may be replaced by 2 cups diced turnips.

Swedish Meat Balls

Ingredients:

- 2 cups soft bread crumbs
- ¾ cup milk
- 2 tablespoons minced onion
- ¼ cup salad oil or bacon fat
- 1 lb. chopped beef
- ¼ teaspoon nutmeg
- 1½ teaspoons salt
- ¼ teaspoon paprika
- 1 egg, slightly beaten
- 2 tablespoons flour
- ⅔ cup milk

Procedure: Soak bread crumbs in milk 10 minutes. Sauté onion in half the oil or bacon fat until light brown. Add to meat with seasonings and slightly beaten egg. Add soaked bread crumbs and put mixture through meat grinder. Form in small balls and sauté in frying pan in remaining fat until light brown on all sides. Sprinkle with flour, coating each, and cook 5 minutes. Add milk, cover and cook 5 minutes. Yield: 16 to 18 small balls.

Liver and Sausage Ring

Ingredients:

- 1 lb. liver (beef, calves', pork or lamb)
- 1 lb. pork sausage meat
- 2 tablespoons chili sauce
- 2 tablespoons horseradish
- 1 tablespoon grated onion
- 2 beaten eggs
- 2 cups dry bread crumbs
- 1 cup water

Procedure: Cover liver with hot water. Cover and simmer 5 minutes. Put through food grinder, using fine plate. Add the remaining ingredients and mix thoroughly. Fill greased 8½-inch ring mold. Bake in moderate oven (350° F.) 1 hour. Serve with chili sauce. Yield: 8 servings.

Braised Heart with Apples

Ingredients:

- 1 lamb heart
- Salt
- Pepper
- Flour
- ½ tablespoon drippings
- 1 tablespoon brown sugar
- 1 clove
- 1 small bay leaf
- ¼ lemon, sliced
- ¾ cup water
- 1 apple, quartered and peeled

Procedure: Wash and trim heart. Cut in about 8 pieces. Roll in seasoned flour and brown in drippings. Sprinkle with brown sugar, clove and bay leaf. Place

slices of lemon on top and add water. Cover tightly and simmer until tender. Add apple and continue cooking 15 minutes.

Heart Fricassee

Ingredients:
- 1 lamb heart
- Flour
- 1 tablespoon bacon drippings
- ½ teaspoon salt
- Pepper
- 2 tablespoons diced onion
- ¼ cup canned tomatoes

Procedure: Wash heart and trim off hard parts as necessary. Cut each half in about 4 pieces. Dredge in flour and brown in bacon drippings. Season. Add onion and brown. Add tomatoes and cover tightly, simmering until tender.

Creole Kidney

Ingredients:
- ½ beef kidney
- Flour
- 2 slices bacon
- 1 small onion, chopped
- 1 tablespoon chopped green pepper
- ½ cup tomato juice
- Salt
- Pepper
- 1 bay leaf
- ½ tablespoon flour
- Water

Procedure: Remove tubes from kidney and cut into ½-inch slices. Dredge with flour. Brown bacon and cut in pieces. Combine kidney and bacon. Add onion and green pepper. Stir until the meat is well browned. Add tomato juice, salt, pepper and bay leaf. Cover closely and simmer about ½ hour. Mix flour and water to a paste. Add a small portion of the hot mixture, stirring to prevent lumping, then add this to the rest of the hot creole and cook until thickened, stirring constantly. If desired, this may be served on toast points.

CHEESE DISHES*

Main Dish Stuffed Potatoes

Ingredients:
- 2 large potatoes
- 1 cup cottage cheese
- ⅛ teaspoon pepper
- 1½ tablespoons melted fat
- ¾ to 1 teaspoon salt

Procedure: Bake potatoes in moderately hot oven (375° F.) about 1 to 1½ hours or until done. Cut in half lengthwise. Scoop out insides (reserve shells); mash. Add remaining ingredients. Beat until light and fluffy. Fill potato shells with mixture. Dot with extra fat; sprinkle with paprika. Bake in moderately hot oven (375° F.) about 15 to 20 minutes until lightly browned on top and thoroughly heated. Yield: 4 servings.

Cheese and Vegetable Casserole

Ingredients:
- 1½ cups milk†
- 2 tablespoons margarine
- 1 cup soft bread crumbs
- 6 ozs. grated process American Cheddar cheese (1½ cups)
- 2 tablespoons minced onion
- ⅛ teaspoon pepper
- ½ teaspoon salt
- 3 eggs, well-beaten
- 1 cup drained, cooked or canned vegetables

Procedure: Heat oven to 325° F. Heat milk with margarine. Pour over bread crumbs in mixing bowl. Add next 4 ingredients. Mix well. Slowly stir in eggs. Arrange vegetables in greased 1½-qt. casserole; pour cheese mixture over them. Set casserole in pan, filled with warm water up to within 1 inch of top of casserole. Bake 75 minutes, or until silver knife, inserted in center, comes

* Health Council of Greater New York.

† Fluid, or evaporated diluted with equal amounts of water, or reconstituted nonfat dry milk.

out clean. Serve as is or with mushroom sauce. Yield: 4 servings.

Gnocchi with Cheese Sauce

Procedure: Add 1 teaspoon salt to 3 cups water and bring to boil. Sprinkle ¾ cup quick-cooking farina gradually into boiling water, stirring constantly. Cook over moderate heat 5 minutes. Remove from heat, add 4 tablespoons margarine and 1 slightly beaten egg. Stir until blended. Pour into greased pan or dish (about 8 x 8 inches) and chill well. Cut into 1½-inch squares and place in greased shallow baking dish. Pour cheese sauce over this.

Cheese Sauce for Gnocchi

Ingredients:

- 3 tablespoons margarine
- 2 tablespoons flour
- 1 teaspoon salt
- ⅛ teaspoon pepper
- 1 teaspoon dry mustard
- 1 teaspoon finely chopped onion
- 2 cups milk, or 1 cup evaporated milk and 1 cup water
- ½ pound cheese, shredded

Procedure: Melt margarine over low heat. Add flour, salt, pepper, mustard and onion and stir until well blended. Remove from heat. Gradually stir in milk and return to moderate heat. Cook, stirring constantly, until thick and smooth. Add cheese, reserving ½ cup to sprinkle on top, and stir over low heat until cheese is melted. Pour sauce over gnocchi and sprinkle with the ½ cup cheese. Bake in moderate oven (375° F.) 30 minutes. Yield: 6 servings.

MISCELLANEOUS MAIN DISHES

Spanish Beans with Liver

Ingredients:

- 1 12-oz. pkg. red kidney beans (1¾ cups)
- 1 qt. cold water
- 1 cup canned tomatoes
- 2½ teaspoons salt
- ¼ teaspoon pepper
- 1 bay leaf
- 2 sliced, medium onions
- 1 minced peeled clove garlic
- ¼ cup fat or salad oil
- ½ lb. sliced beef liver
- 1 tablespoon flour

Procedure: Wash beans, pick over and soak in the cold water overnight. Drain; measure liquid and add enough water to make 3 cups. Add to beans with tomatoes and next 3 ingredients. Fry onions and garlic in fat in a skillet until tender; then add them to beans, reserving oil. Cover; bring to boil and simmer 2 hours or until beans are tender. Meanwhile, dredge liver in flour and fry in reserved oil in skillet until brown on both sides. Cut liver in ¼-inch strips, then fold into beans and serve. Yield: 4 to 5 servings.

Scalloped "Ham," Potatoes and Carrots

Ingredients:

- 1 can luncheon meat or ¾ lb. frankfurters
- 2 tablespoons fat
- 2¼ teaspoons flour
- 1 can condensed cream of mushroom soup, undiluted
- 1 cup milk•
- 3 cups pared, sliced potatoes
- 1 cup scraped, sliced carrots
- ¼ cup minced onion
- Salt and pepper

Procedure: Heat oven to 375° F. Slice luncheon meat or split frankfurters lengthwise. Brown lightly on both sides in fat in skillet. Stir flour into fat left in skillet; add soup. Then slowly stir in milk. Heat to just boiling, stirring. In 2-qt. casserole arrange layers of "ham," potatoes, carrots and onion until all are

• Fluid, evaporated diluted with equal amount of water, or reconstituted nonfat dry milk.

used, sprinkling vegetables lightly with salt and pepper. Pour on soup and milk mixture. Cover; bake for 60 minutes. Uncover; bake 15 minutes longer or until potatoes are tender. Yield: 4 to 6 servings.

Macaroni Meat Casserole

Ingredients:

1 cup uncooked macaroni
1 cup soft bread crumbs
1 tablespoon chopped onion
¼ teaspoon pepper
2 eggs, beaten
1 teaspoon salt
1 cup milk
¾ cup ground beef or
1 cup diced cooked meat
1 8-oz. can tomato sauce, heated

Procedure: Set oven for moderately slow, 325° F. Cook macaroni until tender, according to package directions. Drain. Mix with crumbs, onion, pepper, eggs, salt, milk and meat. Turn into a 1½-qt. greased casserole. Bake 40 to 45 minutes or until a knife inserted in center comes out clean. Serve topped with tomato sauce. Yield: 6 servings.

Macaroni with Frankfurters

Ingredients:

8 oz. elbow macaroni, about 2 cups
6 tablespoons margarine or bacon drippings
1 small onion, grated
6 tablespoons flour
½ teaspoon salt
3 cups milk
1 package (8 ounces) processed sharp American cheese
6 frankfurters

Procedure: Cook macaroni in large amount boiling salted water until tender; drain; place in greased 2½-qt. casserole. While macaroni cooks, melt margarine in medium-size saucepan; blend in onion, flour, salt; stir in milk. Cook over low heat, stirring constantly, until sauce thickens and boils 1 minute. Slice cheese into sauce; heat and stir until cheese melts. Pour over cooked macaroni in baking dish; stir with fork to blend. Score frankfurters with sharp knife; arrange on top, pressing them lightly into macaroni mixture. Bake in moderate oven (350° F.) 30 minutes, or until brown and bubbly on top. Yield: 6 servings.

Baked Macaroni with Tomatoes

Ingredients:

1 package macaroni
4 tablespoons bacon fat
1 medium-sized onion, sliced
¼ cup minced green pepper
2½ cups canned tomatoes
½ teaspoon salt
⅛ teaspoon pepper
¼ lb. sliced cheese

Procedure: Cook macaroni as directed on package, rinse, drain and arrange in greased 2-quart casserole. Melt bacon fat in frying pan, add onion and green pepper, and cook 1 minute. Add tomatoes, salt and pepper (adding more if necessary) and pour over macaroni. Cover with sliced cheese. Bake in moderately hot oven (400° F.) about 20 minutes (until cheese melts). Yield: 6 liberal servings.

Scalloped Potatoes

Ingredients:

6 medium-sized potatoes
Salt
Pepper
2 tablespoons flour
2 cups evaporated milk diluted with
2 cups water

Procedure: Wash and pare potatoes and cut in very thin slices. Place potatoes in greased 2-quart baking dish. Sprinkle with salt, pepper and flour. Pour in milk so that it can be seen through the top layer. Cover and bake in moderate oven (375° F.) 30 minutes. Remove cover and continue baking about 15 minutes longer, until potatoes are tender and a brown crust has formed on the top. Yield: 6 servings.

NOTE: If desired, 2 tablespoons minced onion may be added to the

potatoes. Leftover minced ham may be added.

Spanish Rice

Ingredients:

¼ cup salad oil
1 clove garlic, peeled
1 medium-sized onion, minced
¼ cup chopped green pepper
3 cups boiled rice
1 teaspoon salt
2½ cups canned tomatoes

Procedure: Heat salad oil in large frying pan. Add garlic, onion, green pepper and rice, and cook 3 minutes, stirring constantly. Add salt and tomatoes. Mix well, cover and cook over low heat until tomato juice is absorbed, about 15 minutes. Yield: 6 servings.

NOTE: Add 1 cup chopped cooked meat, if desired.

Spaghetti, Italian Style

Ingredients:

¼ cup salad oil or bacon fat
1 clove garlic, peeled
½ lb. chopped beef or veal
3 tablespoons minced green pepper
3 tablespoons minced onion
2½ cups canned tomatoes
1 4-oz. can tomato paste
1 teaspoon salt
2 teaspoons sugar
1 cup boiling water
1 package spaghetti
Grated cheese

Procedure: Heat salad oil or bacon fat in heavy saucepan. Add garlic and chopped beef or veal, green pepper and onion, and sauté 5 minutes, stirring frequently, until meat is well browned. Remove garlic, if desired. Force tomatoes through a sieve and add tomato paste, salt, sugar and water. Let simmer uncovered over low heat about 1½ hours, until mixture is thick. Stir occasionally to prevent sticking. Cook spaghetti as directed on package, rinse, drain and arrange on hot platter. Pour sauce round it and sprinkle with cheese. Yield: 6 servings.

Toasted Cheese

Ingredients:

1 teaspoon salt
½ teaspoon dry mustard
½ teaspoon paprika
½ lb. cheese
2 eggs
1 cup milk

Procedure: Mix seasonings in greased 9-inch pie pan. Flake cheese with a fork or grate into pan. Break eggs over cheese, add milk and mix with fork. Set in pan of hot water and bake in a moderate oven (375° F.) until set, from about 35 to 40 minutes. Yield: 4 servings.

NOTE: One instead of 2 eggs may be used.

Baked Beans, New England Style

Ingredients:

1 quart pea beans
¾ lb. salt pork
1 tablespoon salt
1 teaspoon dry mustard
¾ cup molasses
1 cup boiling water

Procedure: Wash and pick over beans. Soak in 2 quarts cold water 12 hours. Drain, cover with fresh water, bring to boiling point and simmer over low heat until skins burst when tested. To test: Take up a few beans with spoon and blow. When skins break, the beans are tender. Drain beans and place in bean pot. Scrape rind of salt pork and cut several gashes in the meat. Press into beans. Mix salt, mustard, molasses and boiling water; pour over beans. Add more boiling water, if necessary, to cover beans entirely. Cover and bake in very slow oven (250° F.) from 6 to 8 hours. Add more water when necessary. Uncover and bake 30 minutes longer (until a brown crust has formed). Yield: 10 to 12 servings.

NOTE: If desired, 1 medium-sized onion, minced, may be baked with the beans.

Baked Beans, New York Style

Procedure: Follow preceding recipe for baked beans, New England style, substituting ¼ cup brown sugar, firmly packed, for the molasses. Also, marrow beans may be used to replace the pea beans. If desired, the salt pork may be sautéed from 3 to 5 minutes before combining with the beans.

Note: If an oven is not available, beans may be "baked" by simmering in a heavy covered pot on top of the stove. More liquid may be added during the cooking, if necessary.

Chili Con Carne

Ingredients:

2 tablespoons bacon fat
1 medium-sized onion, minced
1 clove garlic, peeled
1 lb. chopped beef
2 cups canned or cooked kidney beans
1 teaspoon salt
Pepper
½ teaspoon chili powder
2½ cups canned tomatoes
1 cup grated cheese

Procedure: Melt bacon fat in heavy frying pan, add chopped onion and garlic, and cook 3 minutes. Remove garlic, add meat and cook 2 minutes. Add kidney beans, seasonings and tomatoes; mix well. Put in greased 1½-quart casserole, sprinkle with cheese and bake in moderate oven (375° F.) from 15 to 20 minutes, or cover and cook over low heat on top of stove. Yield: 6 servings.

Lima Beans, Baked

Ingredients:

¼ lb. diced salt pork
½ cup sliced onions
1 cup diced carrots
3 cups boiled dried Lima beans
2½ cups canned tomatoes

Procedure: Cook salt pork 5 minutes in heavy frying pan, add onions and carrots, and sauté over medium heat 5 minutes. Add cooked, drained Lima beans, mix well and place in greased casserole. Add tomatoes, cover and bake in moderate oven (350° F.) about 3 hours (until beans are tender). Yield: 6 servings.

Note: Use leftover baked Lima beans as foundation for soup.

FISH DISHES

Codfish, Creamed

Ingredients:

2 cups salt codfish
4 tablespoons butter or margarine
4 tablespoons flour
⅛ teaspoon pepper
2 cups milk

Procedure: Soak codfish in cold water 20 minutes to remove some of the salt; drain. Cut in small pieces. Melt butter or margarine, stir in flour and pepper, and when well blended stir in milk slowly, stirring constantly over low heat until sauce thickens and boils. Add codfish, reheat and serve. Yield: 6 servings.

Baked Cod Fillets Florentine

Ingredients:

1 pkg. frozen chopped spinach
2 tablespoons margarine
2 tablespoons flour
¾ teaspoon salt
2 tablespoons chopped onion
1 cup milk
1 pkg. frozen cod fillets
Dash of pepper
1 cup soft bread crumbs
2 tablespoons melted margarine

Procedure: Set oven for hot, 425° F. Cook spinach according to package directions. Drain well. Melt margarine in saucepan. Blend in flour, ¼ teaspoon of the salt, and onion. Stir in milk and continue cooking, stirring constantly, until smooth and thickened. Mix with spinach. Place cod fillets in a baking dish 10¼ inch x 6¼ inch. Sprinkle with pepper and ½ teaspoon of the salt. Spoon sauce over frozen block of fish. Lightly

toss crumbs, mixed with margarine. Sprinkle over top. Bake 35 to 40 minutes or until fish flakes with a fork and crumbs are brown. Serve at once in baking dish. Yield: 4 servings.

Fish Pie

Ingredients:

2 cups flaked cooked fish
1 cup medium white sauce
2 teaspoons onion juice
1 teaspoon lemon juice
2 cups mashed potatoes
2 tablespoons grated cheese
½ cup fine bread crumbs
2 tablespoons melted margarine

Procedure: Mix fish, white sauce and seasonings. Pour into greased baking dish. Smooth mashed potatoes over top. Sprinkle with cheese and combined crumbs and margarine. Bake in hot oven (400° F.) 20 minutes. Yield: 6 to 8 servings.

Medium White Sauce: Melt 2 tablespoons margarine in heavy saucepan. Add 2 tablespoons flour; mix well. Add 1 cup milk. Cook, stirring constantly, until thickened. Season with salt and pepper. Yield: 1 cup.

Creole Fish and Potatoes

Ingredients:

1 lb. pkg. haddock fillets, quick-frozen
3 tablespoons bacon drippings or fat
½ cup onions, sliced
3 cups potatoes, raw, sliced
1 tablespoon flour
1½ teaspoons salt
⅛ teaspoon pepper
2½ cups canned tomatoes (No. 2 can)

Procedure: Thaw fish according to package directions. Melt drippings in large heavy skillet; add onions and potatoes. Cook over low heat 10 minutes, turn occasionally with wide spatula. Sprinkle with flour, salt, pepper; add tomatoes; cover tightly and cook over low heat about 20 minutes or until potatoes are almost tender. Lay fillets on top of potatoes, cover; after the mixture begins to bubble continue cooking about 15 minutes. Yield: 4 servings.

Tuna-Egg Scallop

Ingredients:

1 7-oz. can light or white tuna
1 tablespoon lemon juice
2 tablespoons butter or margarine
4 tablespoons flour
¼ teaspoon dry mustard
2½ cups milk
3 hard-cooked eggs, chopped
1 tablespoon minced parsley
¼ teaspoon Tabasco
1 cup soft buttered bread crumbs

Procedure: Drain oil from tuna and reserve. Break tuna into pieces and add lemon juice. Melt butter or margarine, add tuna oil, flour and dry mustard. Stir to a smooth paste. Add milk and cook, stirring constantly until mixture thickens and comes to a boil. Add tuna, eggs, parsley and tabasco. Turn into individual casseroles. Sprinkle with buttered bread crumbs. Bake in moderate oven (375° F.) 25 minutes or until crumbs are lightly browned. Yield: 4 to 6 servings.

Tuna Fish Loaf

Ingredients:

2 cups tuna (about 13 ozs.)
⅔ cup soft bread crumbs
½ cup milk
2 eggs
1 teaspoon salt
Cayenne
1 tablespoon lemon juice
1 tablespoon chopped parsley

Procedure: Flake fish in its own oil. Soak bread crumbs in milk for 5 minutes. Stir in unbeaten eggs, seasonings and fish. Pour mixture into greased loaf pan and bake in moderate oven (375° F.) for 40 minutes until firm in the center. Yield: 4 servings.

DESSERTS

Baked Apple Pudding

Ingredients:

7 ¼-inch slices bread
4 tablespoons butter or margarine
3 sliced apples
1 cup sugar

Procedure: Soften butter and spread bread slices. Line bottom and sides of baking dish with bread, buttered side toward the dish. Fill with apples and sugar, and cover with bread. Bake in moderate oven (375° F.) 30 minutes. Yield: 6 servings.

Baked Rhubarb Pudding

Procedure: Follow recipe for baked apple pudding, substituting 4 cups rhubarb for the apples. If rhubarb is very tart, more sugar may be added.

Baked Custard

Ingredients:

3 eggs, slightly beaten
3 tablespoons sugar
½ teaspoon salt
1½ cups evaporated milk diluted with 1½ cups water
Nutmeg

Procedure: Combine slightly beaten eggs, sugar, salt and milk, and stir until sugar is dissolved. Pour into custard cups, sprinkle with nutmeg and place cups in pan of hot water. Bake in moderate oven (375° F.) until set, about 35 minutes. The custard will be cooked when mixture does not adhere to knife when inserted. Cool quickly by placing cups in cold water. Yield: 6 custards.

Bread Pudding

Ingredients:

3 tablespoons softened butter or margarine
4 to 5½-inch slices bread
2 eggs or 4 egg yolks, slightly beaten
¼ cup sugar
¼ teaspoon salt
1 cup evaporated milk diluted with 1 cup water, and scalded
½ teaspoon vanilla

Procedure: Butter bread and arrange in baking dish. Combine slightly beaten eggs or egg yolks, sugar and salt. Add hot milk slowly and stir until sugar is dissolved. Stir in vanilla. Pour mixture over bread, place baking dish in pan of hot water and bake in slow oven (325° F.) until custard begins to set, about 40 minutes. Serve hot or chilled. Yield: 6 servings.

Chocolate Blanc Mange

Ingredients:

1½ cups evaporated milk
1½ cups water
4 tablespoons cornstarch or 8 tablespoons flour
5 tablespoons cocoa
6 tablespoons sugar
¼ teaspoon salt
1 teaspoon vanilla

Procedure: Mix milk with 1¼ cups water in top of double boiler and scald over hot water. Mix cornstarch or flour, cocoa, sugar and salt. Stir in remaining water to this mixture, and when smooth stir into scalded milk. Stir over hot water until thick. Cover and continue cooking 5 minutes or more over the hot water. Stir in vanilla, pour into bowl or 6 custard cups and chill. Yield: 6 servings.

Fruit Custard Pudding

Ingredients:

1 cup evaporated milk
1¼ cups cold water
2 tablespoons cornstarch
1 egg
⅛ teaspoon salt
¼ cup sugar
½ teaspoon vanilla

Procedure: Mix milk with 1 cup cold water and scald in top of double boiler over hot water. Mix cornstarch with remaining cold water (¼ cup) to a

smooth paste and stir into scalded milk. Beat egg slightly, add salt and sugar, and mix with a small portion of the hot mixture; then add slowly to the contents of the double boiler. Stir until thickened. Add vanilla. Serve over sliced bananas or oranges, berries or other fruit, or with cottage pudding.

Rice Pudding

Ingredients:

¼ cup rice
2 cups evaporated milk diluted with
2 cups water
½ teaspoon salt
¼ cup sugar
¼ teaspoon nutmeg

Procedure: Wash rice thoroughly and drain. Combine all ingredients and pour into well-greased baking dish. Bake in very slow oven (250° F.) about 2 hours, stirring at least 3 times during the first hour to break crust that forms. Do not stir during last hour of cooking. Chill before serving. Yield: 6 servings.

Note: Add ½ cup raisins before baking, if desired.

Scandinavian Prune Pudding

Ingredients:

½ lb. prunes
3½ cups water
1 1-inch stick cinnamon
¾ cup sugar
⅛ teaspoon salt
5 tablespoons cornstarch
1 tablespoon lemon juice

Procedure: Wash prunes, cover with 3 cups water and let stand 2 hours. Cook in covered saucepan until soft, about 20 minutes. Drain, save juice and pit prunes. Return fruit and juice to saucepan, and add cinnamon. Combine sugar, salt and cornstarch. Mix with remaining cold water and add to fruit. Cook over low heat, stirring constantly, until mixture thickens, about 5 minutes. Remove cinnamon, add lemon juice, pour into mold and chill. Yield: 6 servings.

Molasses Cake

Ingredients:

2¼ cups sifted flour
¾ teaspoon baking soda
1 teaspoon baking powder
½ teaspoon salt
1 teaspoon cinnamon or allspice
1 teaspoon ginger
½ teaspoon cloves
1 egg
½ cup melted shortening
1¼ cups molasses
¾ cup hot water

Procedure: Mix and sift dry ingredients. Beat egg, stir in melted shortening and molasses. Add sifted dry ingredients alternately with hot water, beating well after each addition. Bake in a greased 9 x 9 x 2 pan in moderate oven (300° F.) 45 minutes. Cut into squares; serve hot or cold. Yield: 16 portions.

One-Egg Cake (Cottage Pudding)

Ingredients:

2 cups sifted flour
3 teaspoons baking powder
¼ teaspoon salt
⅓ cup shortening
1 cup sugar
1 egg
¾ cup milk
1 teaspoon vanilla

Procedure: Mix and sift flour, baking powder and salt. Cream shortening, add sugar slowly and cream until fluffy. Add unbeaten egg and beat well. Add sifted dry ingredients alternately with milk, stirring well after each addition. Add vanilla. Bake in 2 greased 9-inch layer-cake pans, or in greased muffin pans, in moderate oven (375° F.) about 25 minutes, or bake in 1 greased 8-inch square pan in moderate oven (350° F.) about 50 minutes. Cool and frost as desired or use hot with sauce for cottage pudding. Yield: 2 layers, about 16 medium-sized cup cakes or 1 square.

Molasses Cookies

Ingredients:

1 teaspoon soda
1 tablespoon warm water
2½ cup sifted flour
1 teaspoon ginger
1 teaspoon cinnamon
¼ teaspoon salt
½ cup shortening
½ cup sugar
½ cup molasses

Procedure: Dissolve soda in warm water and set aside to cool. Mix and sift flour, spices and salt. Cream shortening, add sugar slowly and cream until fluffy. Stir in molasses. Add sifted dry ingredients and blend thoroughly. Stir in cold soda and water mixture. Add more flour if necessary to make a stiff dough. Roll out thin on a lightly floured board. Cut into shapes and bake in a moderate oven (375° F.) from 8 to 10 minutes. Yield: 4 dozen cookies.

THE USE OF DRY SKIM MILK

As dry skim milk is the most inexpensive form of milk, it can be used to great advantage in the limited food budget. Another advantage is that it can be kept in the package on the kitchen shelf without refrigeration. It has the same food value as skimmed fresh milk. Standard recipes may be used if the powdered dry milk is combined with water in equal amount to the milk indicated in the recipe.

Reconstitution of Dry Skim Milk

Ingredients:

3 tablespoons dry skim milk + 1 cup water can be used instead of 1 cup milk
6 tablespoons dry skim milk + 1 pint water can be used instead of 1 pint milk
¾ cup (12 tbsps.) dry skim milk + 1 quart water can be used instead of 1 quart milk

Procedure: To make dry skim milk into liquid skim milk, just mix it with water in either of the following ways:

Method 1: Pour water into mixing bowl. Sprinkle dry skim milk on top of water. Beat with rotary egg beater until dry skim milk dissolves, occasionally scraping down any powder clinging to bowl.

Method 2: Pour water into jar or shaker large enough so that water only about half fills it. Sprinkle dry skim milk on top of water. Cover tightly and shake until dry skim milk dissolves.

When made into liquid skim milk, keep in cool place just as you would fresh milk.

In some recipes, you may find it more convenient to use dry skim milk in dry form. To use dry skim milk in dry form, just add dry skim milk to the other dry ingredients such as flour and salt, and then use water as the liquid in the recipe. For example, if your recipe calls for 1 cup milk, add 3 tablespoons dry skim milk to other dry ingredients before mixing or sifting. Then follow recipe but use 1 cup water instead of the cup of milk listed in recipe.

Special Recipes for Using Dry Skim Milk

Dry skim milk may be used conveniently in some recipes without reconstituting with water.

Basic Cream Sauce

Ingredients:

2 tablespoons fat
2 tablespoons flour
3 tablespoons dry skim milk
½ teaspoon salt
1 cup water (or water in which vegetables were cooked)

Procedure: Melt fat. Remove from heat. Mix flour, dry skim milk and salt. Add to fat, mixing until well blended. Gradually add water, stirring until well mixed. Cook over low heat, stirring con-

MILK IN DIFFERENT FORMS

THE FOLLOWING ARE ABOUT EQUAL IN FOOD VALUE

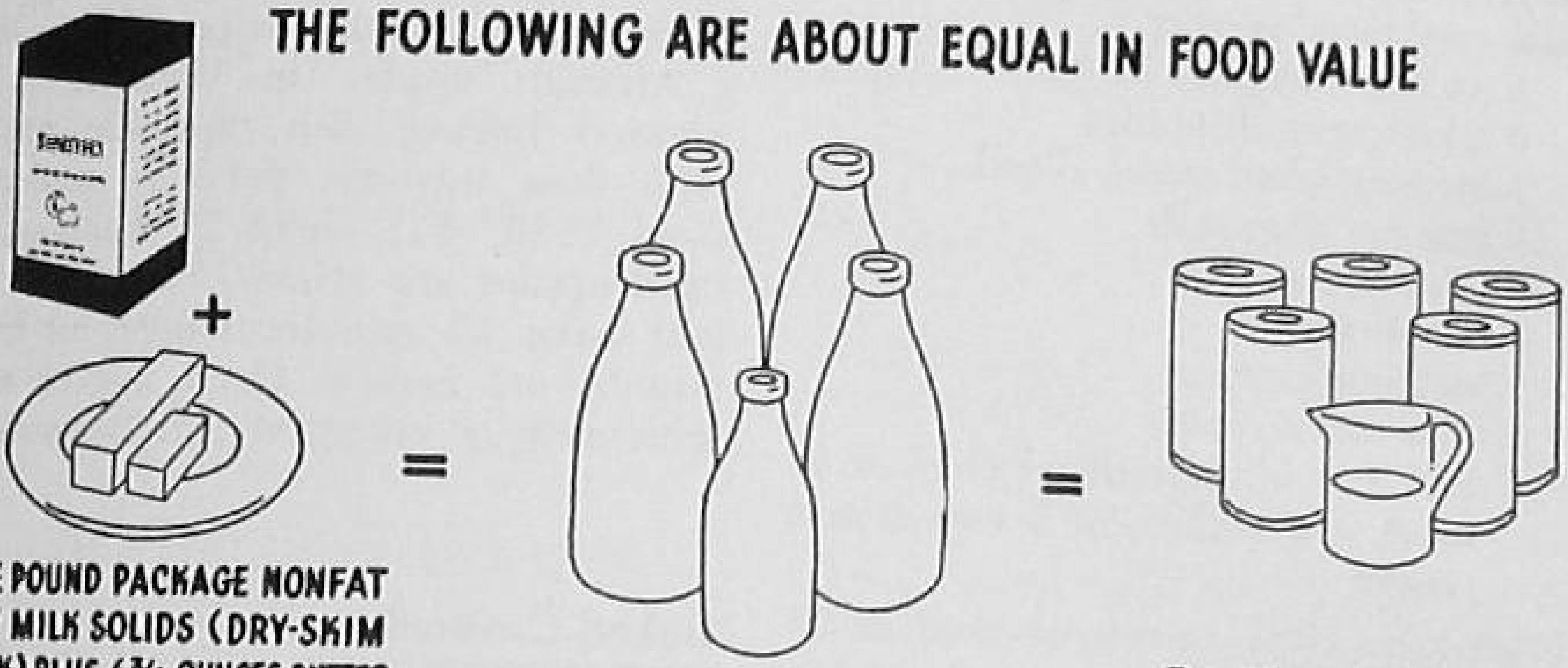

FIGURE 123

stantly until thick and smooth, about 5 minutes. Yield: about 1 cup.

Potato Chowder

Ingredients:

1 teaspoon salt
6 cups boiling water
4 medium-sized potatoes, thinly peeled and sliced
1½ cups dry skim milk
¼ lb. salt pork, diced, or 3 tablespoons vegetable shortening
1 medium-sized onion, sliced
1 green pepper, diced
4 tablespoons chopped celery leaves, if desired

Procedure: Add salt to the boiling water and boil potatoes 5 or 8 minutes, or until tender. Drain. Save water. There should be from 4½ to 5 cups. Mash potatoes. Gradually beat in ½ cup dry skim milk with fork or spoon. Beat in ¾ cup reserved potato water. Add remaining dry skim milk. Mix well. Add remaining potato water. Cook salt pork until browned. Add onion, green pepper and celery leaves. Cook 5 minutes, or until tender and lightly browned. Add to potato mixture. Bring to boiling point, stirring frequently. Yield: 4 to 5 servings.

Fish Chowder

Ingredients:

3 tablespoons fat
2 medium-sized onions, sliced
2 cups diced potatoes (about 2 medium sized)
¾ lb. fish, cut in pieces (uncooked)
1 carrot, sliced, if desired
2 teaspoons salt
¼ teaspoon pepper
7½ cups water
3 tablespoons flour
1½ cups dry skim milk

Procedure: Melt drippings. Add onions. Cook until soft and light brown in color. Add potatoes, fish, salt, pepper, carrot and 6½ cups water. Cover and cook gently about 15 minutes or until potatoes are tender. Mix together flour and dry skim milk. Slowly add remaining 1 cup of water, mixing until smooth. Add to chowder, stirring constantly. Cook 5 minutes or until thickened. Yield: 6 generous servings.

Creamed Noodles with Carrots

Ingredients:

2 cups diced carrots
½ package noodles
3 tablespoons drippings
1 medium-sized onion, sliced
¾ cup dry skim milk
4 tablespoons flour
1 teaspoon salt
⅛ teaspoon pepper
2 cups carrot stock
¾ to 1 cup leftover diced chicken or meat, if available, or ½ cup grated cheese

Procedure: Cook carrots covered in 2¼ cups boiling salted water until tender. Drain and reserve liquor. Cook noodles in generous amount of boiling salted water until tender and drain. Melt drippings in frying pan, add onion and cook over low heat until yellow. Mix dry skim milk, flour, salt and pepper. Sprinkle over the reserved carrot liquor and beat until well blended. Add slowly to onions, while stirring constantly over low heat. Continue stirring until slightly thickened. Add drained carrots and noodles and chicken or meat, if available. Heat to bubbling. Add cheese if meat has been omitted. Stir just until cheese melts. Serve on toast or with mashed potatoes. Yield: 6 servings.

NOTE: Leftover cooked carrots and noodles (2 cups) may be used. Water may replace the carrot stock. String beans, peas or cabbage, or a mixture of vegetables, may replace the carrots.

Apple Crumble

Ingredients:

½ cup sifted flour
¾ cup dry skim milk
¼ cup butter, margarine or other shortening
3 tablespoons sugar
¼ teaspoon nutmeg
¼ teaspoon salt
1 teaspoon cinnamon, if desired
3 cups sliced apples (or about 2 large apples, sliced)

Procedure: Mix flour, dry skim milk, sugar, nutmeg, salt and cinnamon. Cut shortening in with 2 knives or pastry blender until mixture is crumbly.

Arrange apples in shallow, well-greased baking dish. Sprinkle apples with flour mixture. Bake in moderate oven (350° F.) about 25 minutes, or until apples are tender. Remove cover and bake 10 minutes longer, or until crumbs are brown. Good hot or cold with milk or cream. Yield: 6 servings.

Baked Custard

Ingredients:

⅔ cup dry skim milk
½ cup sugar
¼ teaspoon salt
3 eggs, slightly beaten
3 cups boiling water
½ teaspoon vanilla
Few grains nutmeg

Procedure: Add dry skim milk, sugar and salt to eggs. Mix well with fork. Gradually add water and vanilla. Fill custard cups. Sprinkle with nutmeg. Place in pan of hot water and bake in a moderate oven (375° F.) about 30 minutes, or until knife inserted in center comes out clean. Yield: 6 servings.

Cocoa

Ingredients:

5 tablespoons cocoa
5 tablespoons sugar
Dash of salt
½ cup water
1½ cups dry skim milk mixed with 1 qt. water
½ teaspoon vanilla, if desired

Procedure: Mix cocoa, sugar and salt with ½ cup of water until smooth. Boil over direct heat 2 minutes, stirring all the time. Add dry skim milk mixed with water. Heat to boiling. Add vanilla. Yield: 5 to 6 servings.

CHAPTER FIFTY

Recipes for Therapeutic Diets

LOW CALORIE
DIABETIC
HIGH CALORIC, HIGH PROTEIN
ALLERGY
LOW SODIUM

LOW CALORIE RECIPES

Cookery for those who must reduce weight or who, for any other reason, must limit the caloric content of the diet may involve both subtraction and addition This will depend upon the dietary regimen prescribed by the physician. In most dietary prescriptions, the reduction of fats, oil, sugar and flour in the quantities used in standard recipes is necessary. In the interests of flavor, however, certain additions to or replacements in low-caloric recipes can well be made. For instance, lean meats that lack natural fat and that must be cooked with little fat often will be more palatable when onion, garlic, tomato, celery, chives and other herbs are used. They are also valuable in salad dressings, especially when they are made without oil. There are a number of savory dressings with low-caloric count that are suitable for use with both vegetable and fruit salads, as well as with greens.

When a low-fat diet is prescribed, skim milk, now generally available in dry as well as in fresh form, is satisfactory in soups, desserts and in some beverages, and may be used with cereal.

For those who find it difficult to eliminate sweets, saccharin and sucaryl are palatable when they are used according to tested recipes.

Another product, unflavored gelatin—that has low-caloric value—is sometimes an asset in meal preparation, as it gives body that may otherwise be absent in a jellied soup, a salad or a dessert. It extends the apparent size of fruit combinations, and it may serve in the same way when used as an extender for meat or fish. It may also be used with fruit and vegetable juices to increase protein content without materially increasing the calorie count.

Beverages

Saccharin or sucaryl may be substituted for sugar in any beverage in which the other ingredients comply in the proportion allowed on the special diet. The usual allowance for 1 cup of unsweetened liquid is ¼ gr. saccharin tablet or ⅛ Gm. sucaryl tablet or ⅛ teaspoon sucaryl solution.

Soups

Soups made from meat stock, strained, cooled and skimmed, and canned bouillon or consommé, or broth made with bouillon cubes have

Fig. 124. A satisfying luncheon that is low in calories.

little or no caloric value. This also is true when these products are jellied or bought in the form of "madrilene." Clam juice also lacks calories. Any of these clear soups may be flavored with tomato juice and savory seasonings and served in liquid form or jellied.

Tomato juice, served plain or as a seasoning for a cocktail and without dilution, will still have a low-caloric content, as it will when it is jellied. In this same class is a vegetable soup when made with either a stock or tomato juice. A milk vegetable soup made without stock, while higher in caloric count, will be much lower than a cream soup.

Jellied Consommé

Ingredients:

1 tablespoon unflavored gelatin
2 cups well-seasoned soup stock or consommé
Sliced lemon
Minced parsley

Procedure: Soften gelatin in ¼ cup stock. Heat remainder of stock and stir into gelatin. Chill; when set, beat lightly with a fork and serve in soup cups. Serve each with slice of lemon dipped in parsley. Yield: 3 to 4 servings.

Tomato Madrilene

Procedure: Follow directions for jellied consommé (above), substituting 1 cup tomato juice cocktail for 1 cup stock or consommé. If a highly seasoned madrilene is desired, add Worcestershire

Fig. 125. Gelatin is a good stretcher for low-calorie foods in salads, entrées and desserts.

sauce and Tabasco to taste. Serve sprinkled with finely cut Pascal celery or green pepper. Place wedge of lemon on side of plate.

Milk-Vegetable Soup

Ingredients:

- 2 slices onion
- 1 small stalk celery
- 1 small carrot
- 1 cup skim milk
- Salt
- Paprika
- Chives or parsley

Procedure: Peel, slice and chop onion. Chop celery. Scrape and chop carrot. Combine with milk in top of double boiler and cook about 15 minutes until vegetables are tender. Season to taste and serve sprinkled with minced chives or parsley. Yield: 1 serving.

Meats

Roasting and broiling are the easiest methods to use for cooking meat when calories must be limited. Roasting should be done on a rack as, in this way, most of the fat will drip into the bottom of the pan. Extra fat may be trimmed after the meat is sliced and before it is served. Broiling is, of course, always done on a rack. However, pan-broiling calls for a skillet. The surface should be rubbed lightly with fat from the meat or, in the case of veal, extra fat.

If fat accumulates in the pan, it should be poured off during the cooking. When cooking has been completed, the meat should be placed on a paper towel and turned so that extra fat will be absorbed before it is served. For hamburg cakes, lean beef should be ground especially, as normal hamburg contains a comparatively large amount of fat.

Braising is a method used for less tender cuts of meat. The meat should be browned according to directions for broiling, after which liquid is added. A stew for which the meat is cut in pieces calls for the same initial preparation. If fat accumulates in the liquid during the long cooking, the meat should be drained, the liquid chilled and the hardened fat skimmed. The meat then may be reheated in the remaining liquid.

Leftover cooked meat may be combined with vegetables and well-seasoned gelatin mixture. See jellied fish salad on this page.

Fish

The best methods for cooking fish for a low-caloric diet are "poaching" (simmering gently in water in a covered utensil) and baking in greased foil. Fish also may be broiled on a greased broiler rack if the fish is sprinkled lightly with milk or tomato juice. Frying is impractical without the use of a generous amount of fat. Poached fish (see p. 533) may be used to advantage in a jellied salad. "Dietetic Tuna" free from fat is available in canned form, and can replace poached fish in a salad type of recipe.

Baked Fish in Foil

Procedure: Grease pieces of foil about 3 times the size of fish fillet. Season fillet. Place on foil and fold over fillet. Press edges together to seal tightly. Bake in hot oven (450° F.) about 25 minutes.

Jellied Fish Salad

Ingredients:

- 1 envelope unflavored gelatin
- ¼ cup cold water
- 1½ cups boiling water
- ½ teaspoon salt
- 3 tablespoons vinegar
- 1 8-ounce can tuna fish, flaked
- ¼ green pepper, minced
- ½ small onion, minced
- 2 stalks celery, minced

Procedure: Soften gelatin in ¼ cup cold water. Add boiling water and salt and stir until gelatin is dissolved. Add vinegar. Cool; when jelly is nearly set, stir in flaked fish and minced vegetables. Pour into mold and chill until firm. Unmold and garnish with salad greens. Yield: 4 servings.

NOTE: 1 cup canned shellfish or diced cooked meat or chicken may be substituted for the tuna fish.

Vegetables

Special care must be taken in cooking vegetables so as to retain all their natural flavors (see Chap. 45). They must be particularly well seasoned, as the use of butter as a dressing must be limited. Minced parsley, chives or sweet onion, minced celery or green pepper often is a welcome addition. Tomatoes may be used in combination with certain vegetables.

Salads

Salads have a valuable place in a reducing diet. Such large portions of

vegetables and fruit salads may be used that a limited meal will appear to be more satisfying as well as actually be so. The occasional use of an "aspic base" for fruits or vegetables or a combination of both is recommended. Cottage cheese also may be put to good use in salads. Although salad oil in dressings must be avoided or limited in content, there are a number of savory dressings that can be prepared without its use.

Spicy Salad Dressing

Ingredients:

1 medium celery stalk
¼ green pepper, seeded
1 small onion, peeled
1 teaspoon salt
1 (¼ grain) saccharin or (⅛ gram) sucaryl tablet
½ cup vinegar
1 drop Tabasco

Procedure: Grind vegetables together. Add salt and saccharin or sucaryl tablet to vinegar. Beat until tablet is thoroughly dissolved. Add Tabasco. Combine with vegetables. Yield: About ¾ cup.

Tomato Dressing

Ingredients:

1 slice soft bread
1 clove garlic, peeled
2 cups canned tomatoes
1 tablespoon tarragon vinegar
1 teaspoon salt
1 teaspoon paprika

Procedure: Trim crusts from bread. Cut garlic in several pieces. Insert in bread and let stand 30 minutes. Remove garlic. Combine tomatoes and seasonings and add to bread. Beat thoroughly. Yield: About 2¼ cups.

Buttermilk or Yoghurt Dressing

Ingredients:

1 cup buttermilk or yoghurt
1 tablespoon minced onion
1 tablespoon minced green pepper
1 tablespoon minced celery
1 tablespoon catsup
1 tablespoon herb vinegar
Salt to taste

Procedure: Mix ingredients thoroughly and let stand 1 hour or more to ripen flavor. A peeled clove of garlic may be placed in the dressing and removed before dressing is used. The use of yoghurt produces a thicker dressing. Yield: About 1 cup.

Cooked Dressing

Ingredients:

½ envelope unflavored gelatin
2 tablespoons cold water
½ cup boiling water
¼ cup vinegar
1 teaspoon mustard
1 teaspoon salt
1 teaspoon paprika
1 egg, beaten

Procedure: Soften gelatin in cold water. Dissolve with boiling water and add vinegar. Mix seasonings and stir into beaten egg. Add hot liquid slowly and stir over low heat until mixture begins to thicken. Chill thoroughly and beat before serving. Yield: About 1½ cups.

Desserts

In a reducing diet, fresh fruits are the usual choice for dessert. Frozen fruits are packed in a syrup, but this is very light.

When milk is an ingredient, fresh skim milk or reconstituted dry milk may be used. Jellied desserts and low-calorie custards may be made with fresh skim milk or with reconstituted dry milk. They may be sweetened with saccharin or sucaryl. For the sake of consistency and convenience in the following recipes, ¼

gr. saccharin tablets and ⅛ Gm. sucaryl tablets are used alternately. When the same number of tablets is used, the desserts flavored with sucaryl will be sweeter than those flavored with saccharin. The amount of saccharin should not be increased; when too many tablets are used, a slight bitter after-taste may be noticed. The sucaryl tablets may, of course, be reduced. The sucaryl is available both in tablet and liquid form—¼ teaspoon of the solution equals 2 tablets.

Most of the recipes will provide four servings, as these desserts keep well in the refrigerator and can be varied by serving with different fruits. The recipes can, of course, be halved if desired.

Blanc Mange

Ingredients:

- 1 envelope unflavored gelatin
- ¼ cup cold skim milk
- 4 (¼ grain) saccharin or (⅛ gram) sucaryl tablets
- ⅛ teaspoon salt
- 1½ cups scalded skim milk
- 1 teaspoon vanilla or mint extract

Procedure: Soak gelatin in cold milk 5 minutes. Add saccharin or sucaryl tablets and salt to scalded milk and stir until thoroughly dissolved. Add to softened gelatin and stir until thoroughly dissolved. Chill until as thick as unbeaten egg white. Add flavoring and beat until frothy. Pour into serving dish or mold and chill until set. Yield: 4 servings.

Baked Custards

Ingredients:

- 6 (¼ grain) saccharin or (⅛ gram) sucaryl tablets
- ⅛ teaspoon salt
- 3 cups scalded skim milk
- 3 eggs
- 1 teaspoon vanilla extract
- Nutmeg

Procedure: Add saccharin or sucaryl tablets and salt to scalded milk and stir until thoroughly dissolved. Beat eggs until yolks and whites are blended thoroughly and stir in the hot milk. Add vanilla and pour into 6 custard cups. Place in pan of hot water and bake in moderate oven (375° F.) about 35 minutes or until set. Test by inserting knife into custard. When it comes out clean, custards are done. Remove from hot water at once and chill. Nutmeg may be sprinkled over the custards before or after baking.

Applesauce

Procedure: Wash apples. Halve and remove blossom ends. Slice without paring. Place in saucepan with water enough to cover. Cover saucepan and cook until apple pulp is soft. Rub through coarse sieve. Measure pulp. To 1 pint strained pulp add 3 (¼ grain) saccharin or (⅛ gram) sucaryl tablets. Beat thoroughly to dissolve and add salt to taste. Cinnamon or nutmeg to taste also may be added.

NOTE: The applesauce made with sucaryl is sweeter than that made with saccharin, but both are acceptable.

Lemon Jelly

Ingredients:

- 1 envelope unflavored gelatin
- 2 cups cold water
- Rind of ½ lemon
- 6 (¼ grain) saccharin or (⅛ gram) sucaryl tablets
- ¼ teaspoon salt
- 4 tablespoons lemon juice

Procedure: Soften gelatin in ½ cup cold water. Place remaining water in saucepan and add lemon rind. Bring to boiling and remove rind. Add saccharin or sucaryl tablets and salt; stir until thoroughly dissolved. Add to gelatin and stir until dissolved. Add lemon juice. Pour into serving dish or mold and chill until set. Yield: 4 servings.

Jellied Grape Juice

Ingredients:

- 1 envelope unflavored gelatin
- ¼ cup cold water
- ½ cup boiling water
- 4 (¼ grain) saccharin or (⅛ gram) sucaryl tablets
- ⅛ teaspoon salt
- 1 cup reconstituted frozen grape juice

Procedure: Soak gelatin in cold water. Dissolve with boiling water. Add saccharin or sucaryl tablets and salt; stir until thoroughly dissolved. Add grape juice. Pour into serving dish or mold and chill until set. Yield: 4 servings.

DIABETIC RECIPES

Although diabetics can for the most part choose their diets from the foods on the family menu, there are times when so-called "mixed" dishes add desirable variety. The following recipes are based on the material included in the chapter on diabetes. Their source is the pamphlet *Meal Planning and Exchange Lists* prepared by the American Diabetes Association and the American Dietetic Association and published by the Health Publications Institute, Inc., Raleigh, North Carolina.

Lemon Gelatin

(May be used in any amount)

Ingredients:

- 1 teaspoon unflavored gelatin
- 2 tablespoons cold water
- 1 tablespoon lemon juice
- ½ cup water

Procedure: Put cold water in top of double boiler, add gelatin, let stand 10 minutes at room temperature. Place pan over boiling water to dissolve gelatin. If desired, ¼ grain of saccharin to flavor may be added. Remove from stove. Add lemon juice and ½ cup of water. Chill. To make Coffee Gelatin omit lemon juice and use ½ cup coffee in place of ½ cup of water.

Orange Gelatin

(1 serving equals 1 fruit from List 3)

Procedure: Use ½ cup orange juice in place of water in recipe for lemon gelatin.

Pineapple Gelatin

(1 serving equals 1 fruit from List 3)

Ingredients:

- 1 teaspoon unflavored gelatin
- ¼ cup of water
- 1 tablespoon lemon juice
- ⅓ cup pineapple juice

Fruit Gelatin I

(1 serving equals 1 fruit from List 3)

One serving of any fruit from List 3 may be added to lemon gelatin; such as ½ small banana.

Fruit Gelatin II

(1 serving equals 2 fruits from List 3)

One serving of any fruit from List 3 may be added to orange or pineapple gelatin.

Fruit Ice

(1 serving equals 1 fruit from List 3)

Ingredients:

- ½ cup orange juice or ⅓ cup pineapple juice
- 1 tablespoon lemon juice
- 1 egg white
- ½ cup water

Procedure: Combine fruit juice and water; freeze. Stir mixture often while it is freezing. When almost hard, fold in one stiffly beaten egg white.

Fresh Fruit Cup

(1 serving equals 1 fruit from List 3)

Any fruits in List 3 may be combined to make a fruit cup. One-half cup of mixed fruits equals 1 serving. Example:

- Orange, grapefruit, pineapple
- Apple, grapefruit, strawberries
- Peach, orange, blackberries
- Grapes, orange, melon
- Melon, grapefruit, banana

Baked Custard

(1 serving equals ½ cup milk and 1 Meat Exchange)

Ingredients:

- 1 egg
- ½ cup milk
- ⅛ teaspoon vanilla
- Sprinkle of nutmeg
- Few grains salt

Procedure: Beat the egg slightly; stir in milk, salt and vanilla. If desired, add ¼ grain saccharin to flavor. Pour into a custard cup and sprinkle with nutmeg. Set in pan of hot water and bake in a moderate oven (350°) for about 45 minutes. (Other flavors such as almond, lemon, orange or maple may be used in place of vanilla.)

Cheese Fondue

(1 serving equals 1 Bread Exchange and 2 Meat Exchanges and 1 cup milk)

Ingredients:

- 1 egg
- 1 cup milk
- 1 slice bread, cubed
- ¼ cup cheese, diced (1 ounce)
- Salt, pepper, chopped parsley and onion

Procedure: Beat the egg, add milk, bread, cheese and seasoning. Bake in a moderate oven (350°) until firm in the center, about 20 or 30 minutes.

In place of cheese, ¼ cup (1 ounce) of chopped ham, chicken, tuna fish or salmon may be used.

Meat Stew

(1 serving equals 2 or 3 Meat Exchanges and 1 Bread Exchange and 1 serving vegetable from List 2B and 1 Fat Exchange)

Ingredients:

- 1 teaspoon fat
- ½ cup mixed vegetables, list 2B (carrots, peas, onions)
- 2 or 3 ounces meat, cubed
- 1 small potato
- Salt and pepper to taste

Procedure: Brown meat in fat. Add 1 cup water, salt, pepper and a few celery leaves for seasoning. Simmer slowly until meat is tender. Add ½ cup vegetables, List 2B, and any additional vegetables from List 2A, if desired. Cut potato into quarters and add. Cook for 30 minutes or until vegetables are done.

Baked Chicken and Rice

(1 serving equals 1 Bread Exchange and 1 or 2 Meat Exchanges)

Ingredients:

- ½ cup cooked rice
- ¼ or ½ cup diced chicken (1 or 2 ounces)
- ¼ cup clear broth
- Salt and pepper
- Chopped parsley, onions, celery, mushrooms, green pepper, pimiento or tomatoes may be added for variety, if desired.

Procedure: Combine the above ingredients and place in dish. Bake in a moderate oven until brown.

Noodles or spaghetti may be used in place of rice. For the chicken, any type of meat or fish, such as lamb, ham, tuna or shrimp, may be used.

Fish Chowder

(1 serving equals 1 Fat Exchange and 1 Bread Exchange and 1 or 2 Meat Exchanges and 1 cup milk)

Ingredients:

- 1 teaspoon fat
- ½ small onion, chopped
- 1 small potato, sliced
- ¼ or ½ cup cooked fish (1 or 2 ounces)
- 1 cup milk
- Salt and pepper

Procedure: Cook fish in salted water. Melt fat in saucepan, brown the onion. Add cooked fish, sliced potato, ½ cup water in which fish was cooked. Cover and cook for 15 minutes until potatoes are tender. Add milk and seasonings.

Vegetable Soup

(1 serving equals 1 vegetable from List 2B)

Ingredients:

1 cup meat stock or bouillon cube and 1 cup water
½ cup mixed vegetables: carrots, peas
½ small onion, chopped
¼ cup cabbage, shredded
1 stalk celery, diced
¼ cup tomato juice
Salt and pepper

Procedure: Prepare vegetables and add to broth. Boil together until vegetables are just tender, about 20 minutes.

Potato Salad I

(1 serving equals 1 Bread Exchange)

Ingredients:

½ cup cooked potato, diced
1 or 2 tablespoons Zero salad dressing
Salt, pepper, chopped onion, celery, parsley, green pepper, as desired.

Procedure: Combine ingredients and serve.

Potato Salad II

(1 serving equals 1 Fat Exchange and 1 Bread Exchange)

Ingredients:

Use recipe for Potato Salad I except that 1 teaspoon of mayonnaise may be used in place of Zero salad dressing.

Potato Salad III

(1 serving equals 1 Bread Exchange and 1 Meat Exchange and 1 Fat Exchange, if desired)

Ingredients:

1 hard-cooked egg, sliced, may be added to recipe for Potato Salad I or II
¼ cup (1 ounce) diced ham, bologna or frankfurter or 5 small shrimps may be used in place of egg

Zero Salad Dressing

(May be used in any amount)

Ingredients:

½ cup tomato juice
2 tablespoons lemon juice or vinegar
1 tablespoon onion, finely chopped
Salt and pepper
Chopped parsley or green pepper, horseradish or mustard, etc., may be added, if desired.

Procedure: Combine ingredients in a jar with a tightly fitted top. Shake well before using.

Italian Spaghetti

(1 serving equals 1 or 2 Meat Exchanges and 1 or 2 Bread Exchanges and 1 Fat Exchange)

Ingredients:

1 teaspoon fat
½ small onion, chopped
2 tablespoons tomato paste
¼ cup water
Salt, pepper
½ cup tomatoes
1 or 2 ounces ground meat
½ cup cooked spaghetti

Procedure: Brown the onion, hamburg and fat. Add the tomato paste, water and tomatoes. Allow to simmer gently one or more hours. If needed, add more water. Serve on ½ or 1 cup cooked spaghetti. 1 or 2 teaspoons grated cheese may be used.

Macaroni and Cheese

(1 serving equals 1 Bread Exchange and 1 or 2 Meat Exchanges and ¼ cup milk)

Ingredients:

½ cup cooked macaroni
¼ or ½ cup diced cheese (1 or 2 ounces)
¼ cup milk
Salt, pepper, dash of mustard

Procedure: Cook cheese and milk together in double boiler until smooth. Add macaroni and mix well. Bake in moderate oven about 20 minutes or until brown.

In place of macaroni, ½ cup cooked rice, noodles or spaghetti may be used.

Mixed Vegetable Salad

(May be used in any amount)

Ingredients:

Any combination of vegetables from List 2A may be used, such as:

1. Lettuce, cucumber, celery, green pepper
2. Chicory, tomato, radish
3. Lettuce, parsley, raw cauliflower, tomato
4. Escarole, tomato, cucumber
5. Cabbage, celery, green pepper
6. Lettuce, watercress, cucumber
7. Lettuce, raw spinach, radish

Procedure: Salad may be combined with Zero salad dressing, French dressing or mayonnaise, depending upon fat allowed in the meal plan.

HIGH-CALORIC, HIGH-PROTEIN RECIPES

There are a good many ways in which the calorie or the protein content, either of a beverage or a dish, may be increased. For convenience, some high-protein and high-caloric "feedings" may be mixed and stored in the refrigerator for use as needed. A mixture should be re-beaten thoroughly before it is served.

To increase calories

1. Use lactose in addition to sugar. Beta lactose is preferable to ordinary lactose, as it may be stirred directly into the recipe instead of having to be dissolved in hot water before being added.
2. Replace part of the milk with cream or evaporated milk.
3. Add a ball of ice cream to any milk or fruit drink, ginger ale or root beer.
4. If an electric blender is available, any fresh, canned or soaked dried fruit may be combined with milk.

To increase the protein content

1. Beat one or two tablespoons of dry milk into the fresh milk to be used for a recipe by sprinkling the dry milk over the fluid milk in a bowl and beating with a rotary egg beater until completely blended.
2. Use 2 eggs instead of 1 in recipes which call for eggs, or add 1 well-beaten egg to any cold beverage made with milk.
3. Add 1 or 2 tablespoons of one of the many protein supplements which are manufactured by a number of drug and chemical companies. Some of these are low in sodium, which may be of advantage when a high-protein, low-sodium diet is desired. Suggestions for the addition of these will be found in the pamphlets which accompany the products.
4. Add gelatin to hot broth, diluted condensed soups or homemade soups.
5. Add egg whites to fruit juices.

High-Protein Consommé

Ingredients:

¾ cup cold consommé or ¾ cup water and 1 bouillon cube
1 envelope unflavored gelatin

Procedure: Add consommé or water and bouillon cube to gelatin in saucepan. Stir constantly over low heat until gelatin is dissolved and bring almost to boiling. Yield: 1 generous serving.

High-Protein Condensed Soup

Ingredients:

1 can condensed soup
2 envelopes unflavored gelatin
1½ cups milk

Procedure: Place contents of can of condensed soup in saucepan. Soak gelatin in ¼ cup milk. Add remaining milk to condensed soup and heat. Add softened

FIG. 126. A hearty breakfast: orange juice, egg, toast, coffee and milk.

gelatin and stir constantly over low heat until gelatin is dissolved. Bring almost to boiling and serve at once. Or pour into soup cups and chill until set. Or pour into small molds and, when set, turn out and serve with salad greens. Yield: 3 to 4 servings.

Fruit or Vegetable Juice with Gelatin

Procedure: In top of small double boiler, soften 1 envelope unflavored gelatin in ¼ cup cold fruit or vegetable juice. Stir over boiling water until gelatin is thoroughly dissolved. Add ¾ cup of chilled fruit or vegetable juice.

High-Caloric High-Protein Feeding

Ingredients:

- 4 tablespoons beta lactose
- 3 tablespoons Casec
- 10 tablespoons dry skim milk
- 1 pint milk
- 6 eggs
- 1 pint ice cream
- 4 tablespoons chocolate syrup

Procedure: Mix lactose, Casec and dry skim milk. Add milk to make a smooth paste. Beat in eggs. Add ice cream and chocolate syrup. Yield: 6 generous servings.

Skim-Milk Casec Feeding (Low Fat)

Ingredients:

- 1 quart skim milk
- 1½ cups Casec
- 1 egg
- 10 egg whites
- ½ cup beta lactose
- ⅔ cup sugar
- Vanilla or other flavoring

FIG. 127. Protein may be increased by the use of extra dry skim milk in desserts and cookies.

Procedure: Add milk slowly to Casec to make a smooth paste. Add the rest of the milk. Beat in the eggs and the sugars. Add vanilla or other flavoring as desired. Yield: 6 generous servings.

Ice-Cream Feeding

Ingredients:

1 pint milk
¾ cup Casec
2 eggs
1 pint ice cream
Vanilla or other flavoring to taste

Procedure: Add milk to Casec to make a smooth paste. Beat in eggs. Add ice cream and flavoring and mix well. Yield: 6 generous servings.

High-Caloric Fruitade

Ingredients:

1 tablespoon sugar
3 tablespoons beta lactose
1 tablespoon lemon juice
¾ cup orange juice or pineapple juice

Procedure: Add sugar to lactose and fruit juices. Mix thoroughly, chill and serve. Yield: 1 serving.

Ginger-Ale Ice-Cream Soda

Ingredients:

¼ cup vanilla ice cream
1 small bottle ginger ale

Procedure: Put ice cream in a tall glass and pour half the ginger ale over it. Stir until well mixed, then add the remainder of the ginger ale. Serve at once. Yield: 1 serving.

High-Caloric Chocolate Milk Shake

Ingredients:

3 tablespoons beta lactose
1½ tablespoons cocoa sirup

2 tablespoons heavy cream
¾ cup milk

Procedure: Mix lactose, syrup, cream and milk. Beat with rotary egg beater until slightly foamy. Yield: 1 serving.

High-Caloric Eggnog

Ingredients:
1 egg
3 tablespoons beta lactose
¾ cup milk
2 tablespoons cream
⅛ teaspoon vanilla

Procedure: Beat egg and add lactose, milk, cream and vanilla. Mix thoroughly, chill and serve. Yield: 1 serving.

High-Caloric Custard

Ingredients:
2 tablespoons sugar
4 tablespoons beta lactose
1 cup thin cream
1 egg
⅛ teaspoon salt
¼ teaspoon vanilla
Nutmeg

Procedure: Add sugar and lactose to cream; warm to dissolve the sugars. Beat egg, add salt and vanilla; stir in cream mixture. Pour into custard cups and sprinkle with nutmeg. Bake according to directions for baked custard (p. 606). Yield: 2 servings.

High-Protein Custard

Procedure: In above recipe substitute milk for cream and increase eggs to 2.

High-Caloric Cereal Gruel I

Ingredients:
¼ cup farina
⅛ teaspoon salt
2 cups boiling water
1½ cups hot milk
6 tablespoons beta lactose

Procedure: Add farina slowly to salted boiling water and cook over direct heat until thickened. Add hot milk and lactose and cook over water for 1 hour. Yield: 6 servings.

High-Caloric Cereal Gruel II

Ingredients:
2 tablespoons pearl barley or oatmeal
¼ teaspoon salt
1 cup water
2 tablespoons beta lactose
½ cup cream
Sugar or additional salt to taste

Procedure: Add barley or oatmeal slowly to salted boiling water and simmer slowly for 1 hour over direct flame. Strain the liquid into another pan; add lactose and cream and sugar or salt to taste; reheat and serve. Yield: 1-2 servings.

High-Protein Fruitade

Ingredients:
2 tablespoons Protinal
1 cup fruit juice

Procedure: Make a paste of the Protinal with a small amount of fruit juice. Add remaining fruit juice and chill. Stir or shake well before serving. Yield: 1 generous or 2 medium servings.

Fruit Juice with Egg White

Ingredients:
1 egg white
½ cup fruit juice (tomato, orange, pineapple or grape juice, etc.)

Procedure: Cut egg white with 2 knives. Add fruit juice and beat just enough to blend. Avoid beating to a froth. Yield: 1 serving.

Ginger Ale, Grape Juice with Egg White

Ingredients:
2 egg whites
¼ cup chilled grape juice
1 tablespoon lemon juice
¾ cup chilled ginger ale

Procedure: Cut egg whites with 2 knives. Stir in fruit juices. Add ginger ale and stir just enough to blend. Yield: 1 generous serving or 2 medium.

Albumen Lemonade

Ingredients:
4 teaspoons dextrose
Hot water
¾ cup cold water
2 tablespoons lemon juice
1 egg white

Procedure: Dissolve dextrose in a little hot water. Add cold water and lemon juice. Cut egg white with 2 knives and add to lemonade. Strain over ice. Yield: 1 generous serving or 2 medium.

High-Protein Milk Shake

Ingredients:
2 tablespoons Protinal
1 cup milk
Chocolate or other flavoring

Procedure: Make a paste of the Protinal with a small amount of milk. Add the remaining milk, flavor, chill and serve. Yield: 1 serving.

Note: Lonalac may be substituted for the milk to make this beverage salt poor. Lactose may be added for extra calories.

High-Caloric, High-Protein, Low-Sodium Eggnog

Ingredients:
100 grams beta lactose
7 eggs
500 grams Lonalac (dry)
500 cc. 18 per cent cream
Water to make up to 2,000 cc.

Procedure. Place in rotary mixer and mix until well blended. Yield: 8-10 servings.

High-Protein Eggnog

Ingredients:
1 egg white
2⅔ tablespoons dry skim milk
1 egg yolk
1 tablespoon dextrose or sugar
¾ cup milk
Vanilla
Nutmeg

Procedure: Beat egg white until stiff but not dry. Add dry skim milk and mix well. Beat egg yolk and add dextrose or sugar and ¾ cup milk. Combine the two mixtures and flavor with vanilla and nutmeg. If fat is restricted, use fresh skim milk or reconstituted dry skim milk. Yield: 1 generous serving.

High-Protein Malted Milk

Ingredients:
2 egg whites
3 tablespoons malted milk powder
⅔ cup milk, plain or chocolate

Procedure: Beat egg whites until stiff but not dry. Add malted milk powder, mix well and add milk. Yield: 1 generous serving.

High-Protein Milk

Ingredients:
2 egg whites
4 tablespoons dry skim milk
⅔ cup milk
1 tablespoon dextrose
Vanilla or other flavoring

Procedure: Beat egg whites until stiff but not dry. Add dry skim milk and mix well. Add milk and dextrose and vanilla and other flavoring to taste. Blend well. Yield: 1 generous serving.

High-Protein Low-Sodium Beverage

Ingredients:
1 cup Lonalac
1 quart water
1⅛ cups Protinal

Procedure: Make a thin paste of the Lonalac and part of the water. Add the remainder of the water and beat with a rotary egg beater until smooth. To 2 cups of the liquid Lonalac gradually add the Protinal by sprinkling it on top and beating until smooth. Add the remainder of the liquid Lonalac and beat. Chill. Stir well before using. Do not warm. Yield: 5-6 servings.

Variation: Fruit juice may be used in place of Lonalac. This will change the protein but not the sodium content.

Note: There is a variety of low-

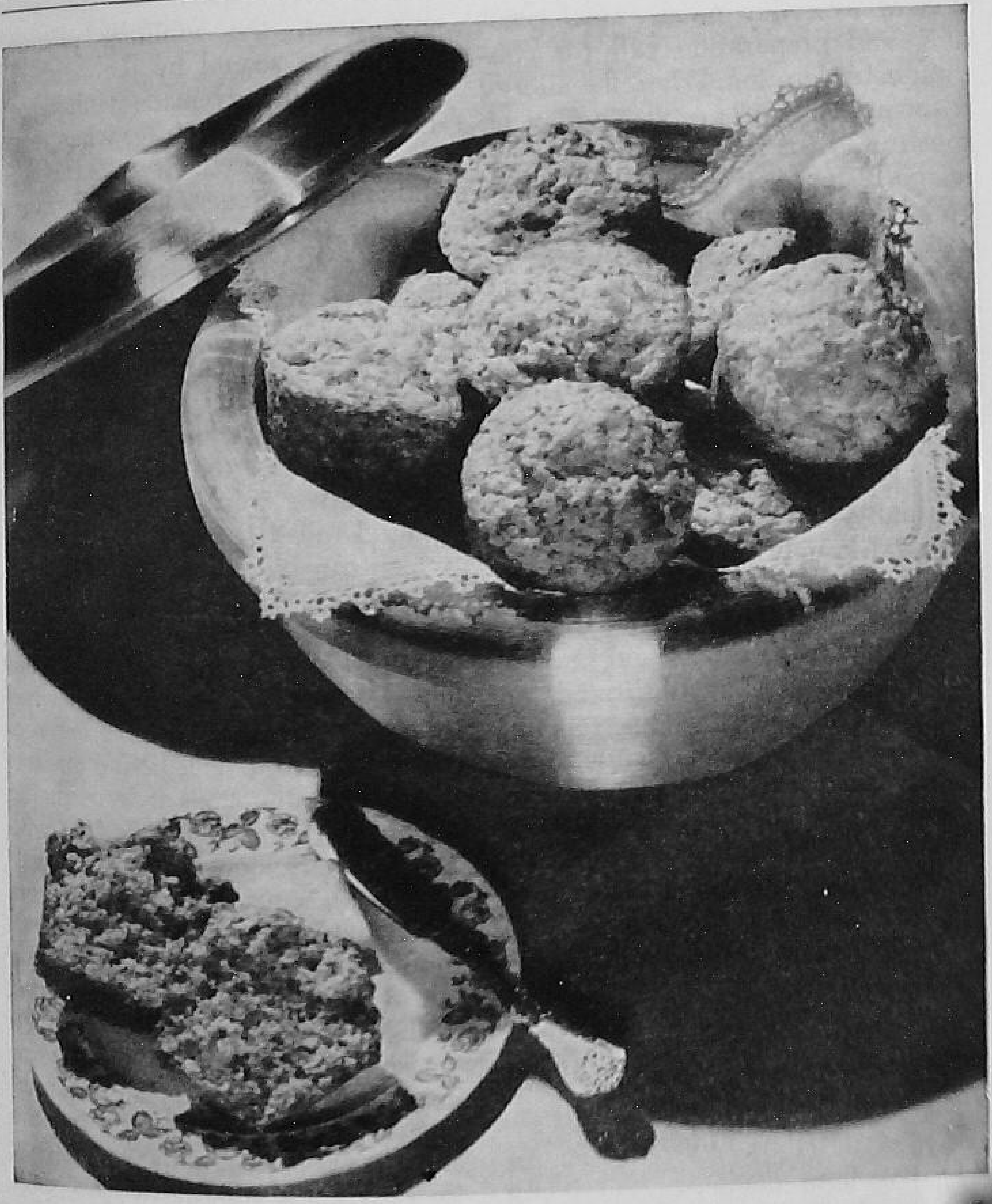

FIG. 128. Bran muffins ready for serving.

sodium high-protein beverages on the market, any of which may be used as above.

ALLERGY RECIPES

The preparation of food for a patient with allergy may be a real problem, especially when the more common types of food produce allergic symptoms. It is not too difficult to eliminate fish, shellfish and certain vegetables and fruits, but when the offenders are milk, eggs and wheat—all of which are used in the prepara-

tion of everyday meals—meal planning and preparation call for constant consideration. When the allergy is toward milk alone, water may be substituted for milk in any standard recipe. When it is toward eggs, then bread, baked products and desserts that call for eggs as an ingredient must be eliminated. When the patient is allergic only to wheat, flours made from other grains or from potatoes can be used in certain recipes, few of which, however, are as satisfactory as when standard wheat flour is used. The crisp rye wafers that are obtainable in every grocery store are used largely for patients allergic to milk, wheat and eggs, as they are free from all of these.

For thickening sauces and gravies, cornstarch may be substituted for flour, half as much as the standard proportion being used. Ready-to-eat cereals such as cornflakes or crisp rice cereal may replace bread and cracker crumbs for toppings and for coating foods for frying. They may also be used in combination with fruits for baked desserts and for pie shells.

Combinations of Flour to Be Used in Place of 1 Cup Wheat Flour

(1)	Rye flour	½ cup
	Potato flour	½ cup
(2)	Rye flour	⅔ cup
	Potato flour	⅓ cup
(3)	Rice flour . . . (10 tbsp.)	⅝ cup
	Rye flour	⅓ cup
(4)	Soy flour	1 cup
	Potato starch flour	¾ cup

When substitutes for wheat flour are used, the resulting products cannot be scored by the standards used for breads made with wheat flour alone, especially when eggs must be omitted. It is sometimes difficult to purchase flours other than wheat, and usually a "health store" is the only place where they can be found. It may be more practical to purchase a "mix" designed for the allergic person than to combine the desired flours. If possible, light-rye rather than whole-rye flour should be chosen, as the whole-rye flour spoils rather quickly. Corn meal and ground rolled oats are two products which can be used to advantage, as they are always available and are generally acceptable.

When small quantities of various flours are to be combined and when coarse flours are used, it is not necessary to sift the flour before measuring, but combinations of flours should be thoroughly mixed and sifted with the other dry ingredients. Most muffins and biscuits have better texture when made in small sizes. If small muffin pans and biscuit cutters are not available, decrease the indicated oven temperatures by 25° and increase the baking time slightly for larger products. For further information with regard to recipes for the allergic patient the nurse is referred to "Revision of Allergy Recipes" prepared by the Diet Therapy Section of the American Dietetic Association.

Breads and Muffins

In the following recipes the letters W-E-M denote the absence of wheat, eggs and milk, according to the initial or initials used.

Rye Bread (W-E-M)

Ingredients:

- 1 cake compressed yeast or 1 envelope quick-rising dry yeast
- 1⅓ cups lukewarm water
- 2 tablespoons sugar
- 1½ teaspoons salt
- 2 tablespoons melted shortening
- 5 cups light-rye flour (approximately)

Procedure: Crumble compressed yeast or empty envelope of dry yeast into large bowl. Add ⅓ cup of the lukewarm water and 1 teaspoon sugar. Stir and let stand 5 minutes. Add remaining sugar, salt and shortening. Stir until well mixed. Stir in half the flour and beat until smooth. Sprinkle about ½ cup of remaining flour on kneading board. Add remainder to mixture, and when well blended turn out on floured board. Knead until smooth and elastic. Place in greased bowl, cover with a towel and let rise over hot water until double in bulk. Divide into two parts and shape each on floured board, kneading until mixture can be shaped into a loaf. Place in greased bread pan and let rise until double. Bake in a moderately hot oven (425° F.) until lightly browned (about 15 minutes). Lower temperature to 350° F. and continue baking about 30 minutes more.

Steamed Rye Bread (W-E-M)

Ingredients:

- ¾ cup rye flour
- ¾ cup corn meal
- ½ teaspoon baking soda
- 1 teaspoon salt
- ¾ cup ground rolled oats
- ½ cup molasses
- ¾ cup water

Procedure: Mix and sift together rye flour, corn meal, soda and salt. Stir in the ground rolled oats. Add molasses and water all at once and stir until well blended. Pour mixture into two greased quart molds or cans. Cover tightly and steam 3 hours. Uncover and place in slow oven (350° F.) for about 20 minutes until tops of loaves are dry. The loaves not used at once may be wrapped in waxed paper for storing and then resteamed in the molds until hot. Yield: 2 loaves.

Banana Rye Bread (W-E-M)

Ingredients:

- 2 cakes compressed yeast
- 3 tablespoons lukewarm water
- 1 tablespoon salt
- 1½ tablespoons sugar
- 3 tablespoons melted shortening
- 2¼ cups mashed ripe bananas[1] (5 to 6 bananas)
- 5¾ to 6 cups light-rye flour

Procedure: Dissolve yeast in water. Mix together salt, sugar, shortening and bananas. Add half the flour and beat until smooth. Beat in the dissolved yeast. Add remaining flour gradually and mix well. Turn dough out onto a floured board. Knead about 8 minutes, adding just enough additional rye flour to prevent sticking. Place dough in a lightly greased bowl. Cover and let rise until double in bulk (about 2 hours). Turn out again onto floured board and knead lightly about 2 minutes. Shape dough into 2 loaves. Place in lightly greased bread pans (8 x 4 x 3 inches). Cover and let rise again until double in bulk (about 1 hour). Bake in a moderately hot oven (425° F.) from 5 to 10 minutes, or until crust begins to brown. Reduce temperature to 350° F. and bake from 35 to 40 minutes longer, or until bread is done. Remove from pans. Brush top crusts with water. Yield: 2 loaves.

[1] Use fully ripe bananas—yellow peel flecked with brown.

Rolled Oats Biscuits (W-E-M)

Ingredients:

2 cups finely ground rolled oats
1 teaspoon salt
3 teaspoons baking powder
3 tablespoons shortening
⅓ to ½ cup water

Procedure: Mix ground oats thoroughly with salt and baking powder. Cut in or rub in shortening until mixture is as fine as coarse corn meal. Stir in enough water to make a stiff dough. Pat out and cut into rounds. For a drop biscuit, add more water and drop by tablespoonfuls on baking sheet. Bake in hot oven (450° F.) from 10 to 12 minutes. Yield: 12 small biscuits.

NOTE: 1 cup light-rye flour may replace 1 cup ground rolled oats.

Rye and Corn-meal Muffins (W-E-M)

Ingredients:

½ cup light-rye flour
½ cup corn meal
3 teaspoons baking powder
1 tablespoon sugar
½ teaspoon salt
½ cup water
1 tablespoon melted shortening

Procedure: Sift dry ingredients together. Stir in water and shortening; continue stirring until blended. Bake in well-greased muffin tins in moderately hot oven (400° F.) from 20 to 25 minutes. Yield: 6 small muffins.

Old-Fashioned Johnnycakes (W-E-M)

Ingredients:

1 tablespoon bacon drippings
½ cup boiling water
½ cup corn meal
½ teaspoon salt
1 tablespoon sugar

Procedure: Add shortening to boiling water. Stir in corn meal, salt and sugar and stir over low heat until mixture thickens. Drop by tablespoonfuls on preheated well-greased griddle and bake until lightly browned on both sides. Lower heat under griddle and bake 5 minutes more, turning often. Yield: 6-8 cakes.

Crisp Corn Pone (W-E-M)

Procedure: Prepare batter for Old-fashioned Johnnycakes. Spread mixture on well-greased 9-inch pie pan. Dot with butter or margarine and bake in moderately hot oven (450° F.) 20 minutes. Place under heat of preheated broiler about 5 minutes until lightly browned. Cut in pie-shaped pieces and serve with butter or gravy.

Butterscotch Wafers (W-M)

Ingredients:

½ cup unsifted rye flour
¾ teaspoon baking powder
¼ teaspoon salt
¼ cup shortening
1 cup brown sugar, firmly packed
1 egg, well beaten
¾ cup chopped nut meats

Procedure: Mix flour, baking powder and salt. Melt shortening, stir in sugar and mix well. Remove from heat and stir in well-beaten eggs. Stir in sifted dry ingredients to which nut meats have been added. Drop by ½ teaspoonfuls on greased baking sheet and bake in slow oven (325° F.) about 15 minutes. Cool slightly, then remove carefully with a thin knife or spatula. If cookies harden on sheet, return to the oven for a few minutes. Yield: About 3½ dozen cookies 2 inches in diameter.

Quick Chocolate Drops (W-E)

Ingredients:

2 squares chocolate, melted
1⅓ cups (14½-ounce can) sweetened condensed milk
2 cups chopped nut meats or 3 cups shredded coconut

Procedure: Blend melted chocolate with condensed milk. Stir in chopped nut meats or coconut and mix well. Drop by teaspoonfuls on greased baking sheet and bake in moderate oven (350° F.)

from 15 to 20 minutes. Yield: 4 dozen cookies 1 inch in diameter.

NOTE: This recipe may be halved if there is some other use for the condensed milk. These cookies keep indefinitely, however, and it may be more practical to make up the entire recipe.

Rice Krispies Marshmallow Squares (W-E-M)

Ingredients:

¼ cup vegetable shortening
½ pound eggless marshmallows (about 2½ dozen)
½ teaspoon vanilla
1 package crisp rice cereal (5½ ounces)

Procedure: Cook shortening and marshmallows in double boiler (about 30 minutes). Add vanilla and beat thoroughly to blend. Put Rice Krispies in large greased bowl and pour on marshmallow mixture, stirring briskly. Press into shallow greased pan. Cut into squares when cool. Yield: 32 2-inch squares.

Meringues (W-M)

Ingredients:

1 egg white
¼ cup sugar
Dash salt
⅛ teaspoon vanilla

Procedure: Beat the egg white until stiff and dry. Beat in gradually half the sugar and the salt. Fold in remaining sugar and vanilla extract. Drop meringues by tablespoonfuls on ungreased baking sheet, piling mixture high in center. Bake in slow oven (275° F.) from about 40 to 45 minutes (until meringues are dry on the surface and will slip off the sheet easily). Remove from sheet with wet knife. If meringues are to be served with ice cream, press in bottom crusts. Yield: 6 small meringues.

Apple Tapioca (W-E-M)

Ingredients:

2 medium-sized apples (⅔ pound)
2 cups boiling water
1½ tablespoons lemon juice
2 tablespoons butter
¾ cup light-brown sugar, lightly packed
⅓ cup quick-cooking tapioca
½ teaspoon salt
⅛ teaspoon nutmeg
⅛ teaspoon cinnamon

Procedure: Pare, core and slice apples. Put into greased 8-inch baking dish. Add boiling water, lemon juice and 1½ tablespoons of the butter. Cover and bake in a moderately slow oven (350° F.) 25 minutes, or until apples are almost tender. Remove cover and stir in a mixture of ½ cup of the sugar, tapioca, salt and spices. Mix thoroughly. Bake, uncovered, 5 minutes longer, then stir mixture well. Sprinkle top with remaining sugar and dot with remaining ½ tablespoon butter. Bake 10 minutes longer, or until tapioca is clear. Serve warm or cold. Yield: 4 servings.

Apple Strudel (W-E-M)

Ingredients:

5 cups cornflakes
3 cups sliced apples
¾ cup sugar, granulated or brown
Cinnamon
3 tablespoons butter or margarine

Procedure: Put layer of cornflakes in greased 1½-quart casserole. Cover with layer of apples. Add half the sugar, sprinkle with cinnamon and dot with one third of the butter or the margarine. Add another layer of cornflakes, remaining apples and sugar. Sprinkle with cinnamon and dot with more butter or margarine. Put layer cornflakes on top, dot with remaining butter or margarine and sprinkle with a little sugar. Cover casserole and bake in moderate oven (375° F.) about 35 minutes, or until apples are soft. Serve hot or cold with cream. Yield: 6 servings.

NOTE: Add about 2 tablespoons water to strudel before baking if apples are not juicy. Sprinkle few drops lemon juice over apples if they are not tart.

Cream Sauce (W-E)

Ingredients:
1 tablespoon shortening
1 tablespoon cornstarch
¼ teaspoon salt
Few grains pepper
1 cup milk

Procedure: Melt shortening. Stir in cornstarch, salt and pepper. Stir in milk. Stir and boil 5 minutes. Serve on 2 cups (1 pound) of cooked or canned vegetables, flaked fish, diced meat or 4 sliced hard-cooked eggs. Yield: 4 servings.

Rice Stuffing (W-E-M)

Ingredients:
½ cup rice
½ teaspoon salt
3 cups boiling water
½ cup diced celery
¼ cup diced onion
½ cup fat
5½ cups (1 package) crisp rice cereal
2 tablespoons minced parsley
1 tablespoon poultry seasoning
½ teaspoon salt
½ cup stock or water

Procedure: Wash rice thoroughly in a sieve and drain well. Add rice to boiling salted water slowly so that water continues to bubble. Boil rapidly 15 to 20 minutes until rice is tender. Drain in sieve. Brown celery and onion in fat. Stir in rice and mix well. Crush Rice Krispies into coarse crumbs. Add parsley, seasonings and stock. Combine with rice and mix thoroughly. Yield: 3½ cups stuffing.

Note: Stuffing may be baked in a covered casserole in moderate oven (375° F.) for 25 minutes.

KETOGENIC DIET

The ketogenic diet is extremely low in carbohydrate. The usual types of bread are seldom permitted on this regimen. The following recipe for muffins may have some use as a substitute:

Bran-Soy Muffins

Ingredients:
15 grams Battle Creek cooked bran or White Rose cooked bran
25 grams soy flour
¼ teaspoon salt
½ teaspoon baking powder
28 grams butter, sweet
⅜ cup water
2 egg yolks
2 egg whites, stiffly beaten

Procedure: Mix dry ingredients. Melt butter. Add water and melted butter to the dry-ingredient mixture. Fold in egg yolks and stiffly beaten egg whites. Bake in 12 small lightly greased muffin tins in moderately hot oven (425° F.) 15 to 20 minutes. Each muffin contains 0.1 Gm. carbohydrate, 1.8 Gm. protein and 3 Gm. fat.

LOW-SODIUM RECIPES

When the physician has prescribed a low-sodium diet, salt as a seasoning must be avoided completely. This applies not only to its use on the table and in cookery but also to the selection of processed or manufactured products such as canned or frozen vegetables, salad dressings, meat sauces such as catsup and chili sauce, with the exception of Tabasco sauce, and to bread and some cereals. Only canned foods and breads whose labels indicate that they are salt-free should be chosen.

Among cereals, those on the following list* are processed without salt. (No salt should be used in preparing the hot cereals.)

Barley
Corn meal, popped corn
Cracked wheat, puffed wheat, shredded wheat, wheat germ,

* Hasker, R. R.: The Cook Book for Low Sodium Diet, The American Heart Association, Inc., 1950.

Wheatena, Wheatsworth
Cream of Wheat, regular
Oatmeal, regular
Farina, regular
Groats
Maltex
Pettijohns
Instant Ralston
Macaroni, spaghetti
Rice, puffed rice, wild rice

Cooked foods and salads may be made more palatable with the use of spices and herbs if these are low in sodium content. With the exception of products such as garlic, onion and celery salt, that are combinations of these condiments with salt, and of celery and parsley flakes, the majority of spices are low in sodium (see Table 7, Part Four).

Certain herbs and spices have been found to blend or contrast better than others with various foods. The following suggestions may be found useful:

Allspice: meat
Angostura bitters: sauces, meat
Anise: bread
Bay leaf: meat, soup, fish
Basil: salad, egg dishes, tomatoes
Caraway seed: meat, vegetables, cheese
Celery seed: meat, vegetables, salad, soup
Chervil: salad, soup, fish sauces, egg dishes
Chili powder: meat, vegetables
Cloves: meat, fruits, desserts
Cumin: meat, vegetables
Curry (salt-free): meat, vegetables
Dill: meat, fish, vegetables, soup
Garlic: meat, salad
Ginger: meat
Leeks: soup, meat
Mace: meat, sauces, cakes, sweets
Marjoram: meat, vegetables, salad, fruit
Mint: beverages, meat, confections, desserts
Mustard, dry: meat, fish, salad
Nutmeg: cake, desserts
Onion: meat, salad, vegetables
Oregano: meat, tomato sauce
Parsley: salad, soup, meat, vegetables, garnish
Pepper: meat, vegetables, salad, dressing
Poppy seeds: meat, macaroni products
Poultry seasoning: stuffings, meat
Rosemary: salad, meat, fish
Saffron: meat, fish, rice
Sage: poultry and fish stuffing
Tabasco: meat, vegetables, soup, salad dressing
Tarragon: salad, soup, meat
Thyme: stuffing, soup, meat

Tomato Juice Cocktail

Ingredients:
1 cup salt-free tomato juice
1 tablespoon lemon juice
1 teaspoon sugar
Celery seed
Minced onion

Procedure: Combine ingredients and chill. Shake or stir well before serving. Yield: 2 servings.

Tomato Aspic

Ingredients:
2 cups salt-free tomato juice
1 bay leaf
4 whole cloves
1 slice onion
6 peppercorns
1 envelope unflavored gelatin
1 tablespoon lemon juice

Procedure: Measure 1½ cups tomato juice into saucepan. Add bay leaf, cloves, onion and peppercorns. Bring to a boil and simmer 10 minutes. Strain.

Soften gelatin in remaining ½ cup tomato juice and dissolve in hot tomato juice. Add lemon juice. Pour into mold and chill until firm; serve as a basis for a salad. Or break up with fork before placing in soup cups. Yield: 4 servings.

French Dressing

Ingredients:

⅜ cup salad oil
½ teaspoon paprika
⅛ teaspoon dry mustard
½ teaspoon sugar
2 tablespoons vinegar
2 tablespoons lemon juice

Procedure: Place all ingredients in bowl and chill thoroughly. Just before serving, beat vigorously with fork until well blended. Yield: ½ cup.

Variations:

1. Substitute grapefruit juice for the vinegar.
2. Add ¼ cup strained fresh tomato pulp or salt-free tomato juice.
3. Add peeled clove of garlic before chilling. Remove garlic before serving.
4. Add dash of Tabasco to taste.

Liver-Rice Loaf

Ingredients:

½ cup cooked salt-free rice
½ cup chopped cooked salt-free liver
½ cup salt-free bread crumbs
1 egg yolk, well beaten
½ cup Lonalac
¼ teaspoon pepper
⅛ teaspoon sage
½ tablespoon salt-free melted butter

Procedure: Combine ingredients, except the butter. Form into loaf and place in greased pan. Pour melted butter over mixture. Bake in slow oven (325° F.) 1 hour. Serve with salt-free tomato sauce. Yield: 3 servings.

Meat Patty

Ingredients:

¼ pound ground beef
2 teaspoons minced onion
¼ teaspoon dry mustard
Few grains pepper

Procedure: Combine all ingredients and form into 2 small patties. Brown on both sides in a lightly greased skillet. Add a few drops of water, and continue cooking, covered, until meat is done. Yield: 2 servings.

Veal Casserole

Ingredients:

1 pound veal cutlet
Flour
Pepper
3 tablespoons olive oil
½ garlic, peeled
2 tomatoes, peeled and sliced
2 tablespoons flour
1 cup water
¼ teaspoon basil
1 tablespoon minced parsley

Procedure: Dredge meat with flour and pepper. Heat oil and garlic. Brown meat on both sides in the oil. Remove garlic. Arrange tomatoes in casserole and arrange meat on top. Stir 2 tablespoons flour into oil remaining in skillet. Add water and stir until well blended. Add basil. Stir over low heat until sauce thickens. Add parsley and pour over meat in casserole. Cover and bake in moderate oven (350° F.) 1 hour until meat is tender. Yield: 4 servings.

NOTE: 1 small can salt-free mushrooms may be used in place of ½ cup water.

Savory Steak

Ingredients:

1 flank steak
Flour
Pepper
3 tablespoons salt-free fat
2 onions, peeled and sliced
1 small green pepper, seeded and sliced
1 bay leaf
3 cloves
2 tablespoons minced carrot
2 cups salt-free tomatoes
1 teaspoon sugar

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Beef Juice

Ingredients:
½ lb. lean beef
Salt

Procedure: Broil beef (about 4 inches square and 1 inch thick) on both sides. Two minutes should be sufficient.

Lay beef on a plate, sprinkle with salt, cut in pieces, place in meat press or potato ricer and squeeze out all the juice. Yield: About 2 ounces or 4 tablespoons juice.

Sufficient juice for two servings is generally prepared at one time. To warm the second portion, place the juice in a cup, set cup in boiling water, stir juice constantly until it is a little more than lukewarm and serve at once.

Beef Tea

Ingredients:
1 lb. chopped lean beef
1 pint cold water
½ teaspoon salt

Procedure: Place finely chopped or ground beef in a fruit jar. Add cold water and allow to stand 1 hour. Place jar in a saucepan of cold water with a cloth on the bottom of pan under the glass and heat the water over low heat. Be careful not to let it boil. Keep below boiling for 2 hours. Then slowly increase heat sufficiently to turn the beef tea a deep chocolate color. Strain and add salt. Never allow beef tea to boil, either in making or in reheating. Yield: 2 servings.

Liver Juice

Procedure: Score raw liver and sear on both sides over high heat. Place seared liver in a square made of gauze and squeeze out juice. There should be about ⅙ cup of juice from 1 pound liver. Season if desired. Yield: 1 serving.

Liver Soup

Ingredients:
3 oz. liver
1 cup broth or tomato juice
Salt

Procedure: Scrape liver. Add to clear broth with fat removed or to tomato juice. Simmer 5 minutes. Season with salt and onion juice or celery salt to taste. Yield: 1 serving.

(For soups other than those made from meat, see Chap. 47.)

STUDY QUESTIONS

1. Discuss the change in trend in meat consumption in the United States.
2. Why must meat be handled carefully in its preparation for market and also in the home kitchen?
3. Give the reasons why meat is considered to be a valuable part of the diet. State why liver and other organs have a particularly high rating.
4. Discuss the digestibility of meat. Why is the white meat of chicken often served early in convalescence?
5. Outline the principles of meat cooking. Why should particular precautions be used in cooking pork?
6. Compare the vitamin values of raw and cooked meats.
7. What is the value of meat soups, broths and juices?

Fish, Including Shellfish

FOOD VALUE
SHELLFISH
OTHER FOODS GROUPED WITH FISH
DIGESTIBILITY
PLACE IN THE MENU
SELECTION AND CARE OF FISH
FISH REICPES
SELECTION AND CARE OF SHELLFISH
SHELLFISH RECIPES

Fish and meat compare well in the chief nutritive constituent protein. Fish, however, has fewer extractives, which are responsible for the characteristic flavors of meat. While various types of fish have a certain individuality of flavor, except in the case of shellfish, they do not differ in this respect as much as does the flesh of different animals. Varieties of fish not ordinarily used are now being introduced to the markets and a definite effort is being made to stimulate production and use of both salt-water and fresh-water fish. Modern methods of quick freezing are making it possible for communities far from sources of production to have a regular distribution of good-quality fresh fish. Canned fish, such as salmon and tuna, canned shrimp and, to some extent, crab, lobster and South African rock lobster tails are also largely used. There is also some demand for salted and smoked fish.

FOOD VALUE

Weight for weight, fish is not generally so high in calories as meat, because of the lower fat and the higher water content. Fish is rich in gelatin, which is soluble in hot water. For this reason more of the nutritive value is lost in boiling fish than in baking or broiling.

As will be seen in Table 1, Part Four, there is little difference in the protein content of the various fish. There is a great difference, however, in the fat content, which varies from less than 1 per cent to more than 12 per cent. This factor has led to the classification of fish under two heads: fish low in fat and fish high in fat. The amount of fat in all fish varies somewhat with the season of the year, with the time of spawning and with changes in feeding conditions. It may be noted that certain fish which have very little fat in the edible portion have a comparatively large amount in the liver. Fish liver furnishes oil which is high in both vitamins A and D. Cod and halibut are commonly used, but mackerel, tuna, swordfish and several other species yield liver oils which are more potent.

Salt-water fish are valuable be-

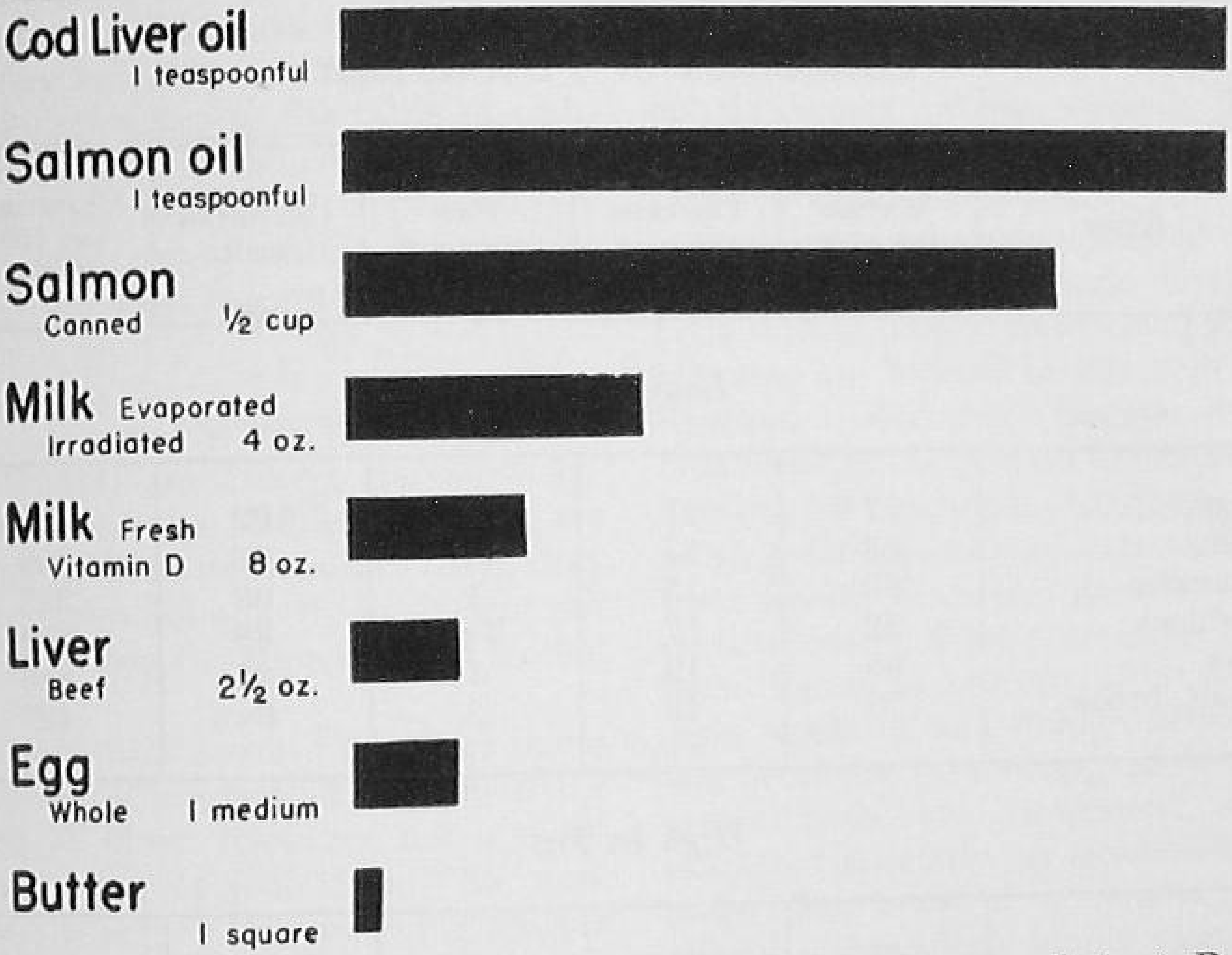


FIG. 108. Sources of vitamin D. Fish is the richest natural source of vitamin D. (Philadelphia Child Health Society)

cause of their iodine content. The phosphorus and the calcium which they contain are about equal to those of meat, but the iron content is lower.

Fish eggs, which are known as roe, are used to some extent as food and are counted a delicacy. Of these, shad roe may be obtained in both fresh and canned form. The roe of the sturgeon, which is known as caviar, is obtainable in salted form. So-called fresh caviar is mildly salted and packed in tin or in glass. It is much more expensive than the caviar which is more highly salted, packed in barrels for export and later canned. Caviar, which was once a common product in the United States before the American sturgeon was practically exterminated, is now imported from Russia. A small amount of inexpensive white-fish caviar is produced in the United States. In contrast with shad roe, which is used as a main dish, caviar is used merely as an appetizer and seldom has a place in the diet of an invalid.

Shellfish may be divided into two classes: mollusks and crustaceans. Mollusks include oysters, clams, mussels and scallops; crustaceans include lobsters, crabs and shrimps.

Like other seafoods, these are all valuable for their protein content, although they vary in the percentage composition, as will be seen by consulting the several tables which follow. Most shellfish are high in

Composition of Typical Fish

Kind	Water per cent	Protein per cent	Fat per cent	Calories per lb.	Calories per 100 Gm.
Low in Fat					
Bass	77	21	2	102	463
Cod	83	17	Tr.	68	309
Flounder	83	15	1	69	322
Haddock	82	17	Tr.	68	309
Pike	80	19	1	85	386
Trout, brook	78	19	2	94	427
High in Fat					
Bonito	68	24	7	159	722
Herring	73	19	7	139	631
Mackerel	68	19	12	184	835
Salmon, Pacific	63	17	17	221	1,003
Shad	70	19	10	166	754
White Fish	70	23	7	155	704

Proximate Composition of Shellfish

Description	Water per cent	Protein per cent	Fat per cent	Carbo-hydrate per cent	Cal-ories per Lb.	Cal-ories per 100 Gm.
Clams, long and round	80	14	2	2	82	372
Crabs	80	16	2	1	86	390
Lobsters	79	16	2	1	86	390
Mussels	77	14	2	5	94	427
Oysters	80	10	2	6	82	372
Scallops	80	15	Tr.	3	72	327
Shrimps	78	18	1	1	85	386

minerals; as a class they constitute a very valuable source of iodine.

By reference to the table of composition of shellfish, it will be noted that they are all of approximately the same composition. As a class, they are high in protein and low in fat.

Oysters

Oysters are among the most important of the shellfish, as they are often used in the invalid's diet. They are grown abundantly in shallow salt water along the shores of the United States.

The usual season for oysters opens the first of September and closes the first of May. They are not a desirable article of food during the summer, which is the spawning season. This season varies in different localities, but covers a period of from four to six weeks. After harvesting, oysters should be kept alive until required for use.

Among the best-known varieties are blue points, lynnhavens, rockaways, saddle rocks, shrewsburys, etc. Such names formerly indicated the locality in which the oysters were grown, but this no longer holds, the name generally denoting merely the size of the oyster. For example, the name blue point is now given commonly to oysters not exceeding 2 or 2½ inches in length.

Oysters are valued especially for their iron, copper and iodine content. They also contribute some calcium, phosphorus, vitamins A and C, and comparatively larger amounts of the vitamins of the B complex. As the caloric value is low, oysters are used in the general diet, particularly on account of their flavor and their digestibility. Raw oysters rank first on this count. When cooked, the cooking period should always be short to avoid toughness.

Oysters may be contaminated by water polluted by sewage. Oyster beds which supply commercial distributors are located in safe waters. Shucked oysters may become contaminated in the process of shelling, because of improper handling. A much greater number of bacteria has been found in shelled than in unshelled oysters. Since organisms have been found in oysters, after even eight weeks of cold storage, cooking is a necessary precaution, unless the oyster beds are supervised and examined regularly, as is customary under the laws of a number of coastal states which supply most of this popular shellfish.

Oysters in the shell may be served raw, broiled or baked, and out of the shell stewed, creamed, scalloped, fried and roasted. In choosing oysters those with tightly closed shells should be selected. The oysters should have a good odor, should not be ropy or slimy, and should not be "bloated" by placing them in fresh water.

Clams

Clams rank next to oysters in popularity. They are of two kinds, hard and soft shell. They are found just below the surface of sand and mud at low tide and are dug with shovel and rake. The long soft-shelled clams are found abundantly on the New England coast. The round hard-shelled clams, called quahaugs, are found from New York

to Florida. The very small round clam is known as the little neck.

Clams are most abundant during the closed oyster season. Little-neck clams are served raw and often take the place of blue points on hotel and restaurant menus. They do not differ much from oysters in food value. Clams are lower in minerals and vitamins than oysters.

Quahaugs, or large clams, are used for chowder, broth and frying. Soft-shelled clams are boiled, steamed and used in chowders. In choosing clams, those with unbroken shells should be selected. If open, they should close quickly when touched and have a good odor. The sanitary precautions given for oysters should apply to clams, mussels and scallops.

Mussels

Mussels are not generally used for food in the United States, but are used extensively in France, Holland and England. They are found in both fresh and salt water.

Scallops

Scallops, like oysters, are bivalves, but only the muscle which opens and closes the shell is used for food. Two types of scallops are found in the waters of the Atlantic and the Gulf of Mexico. Those which are found in shallow waters are smaller and more tender than the deep-sea scallops. Scallops are sold by the quart or pound and may be broiled, fried, baked or used for chowder. They have a comparatively high mineral and vitamin content.

Lobsters

Lobsters are salt-water crustaceans and are found in Atlantic waters from Newfoundland to New Jersey. They are most plentiful in summer. Lobsters have a dark-greenish hard shell which turns red during cooking.

Live lobsters heavy for their size should be chosen. There should be an active, quick response to touch. After boiling, the tail should spring back when straightened out. This test shows that the lobster was alive before cooking. Lobsters may be served boiled, baked, creamed or broiled.

Large crawfish are sometimes called lobster. The flavor is not unlike that of lobster. Frozen South African rock lobster tails are now in rather general distribution in our markets. As the fish are taken from the very cold antarctic current, trimmed and fast-frozen immediately, the quality of the meat is very good and suitable for boiling and broiling. The tails range in size from 4 to 16 ounces.

Crabs

Several types of crabs are found along the Atlantic and the Pacific coasts. Soft-shelled crabs are small Atlantic crabs which have shed their shells. They are usually cooked whole. The meat of the hard-shelled crab is usually picked after boiling and shipped packed in ice or canned. Most of the canned crabmeat comes from the large crabs of the Pacific Ocean, although some is now coming from Atlantic waters. Crabmeat supplies a fair amount of minerals and vitamins.

Shrimps

Shrimps from Southern waters, which are used commonly, actually belong to the prawn family. True shrimps are found to some extent along both the Atlantic and the Pacific coasts. A large amount of the tail meat of the Southern shrimp is canned and furnishes the principal supply. In this form shrimp is used for salads, cocktails and luncheon dishes. Shrimps rank next to oysters in mineral content and supply some vitamins.

Shrimp is perhaps the most popular shellfish, as it lends itself well to canning which has made possible its wide distribution. Fresh shrimp is boiled before or after shelling and may be served in or out of the shell.

OTHER FOODS GROUPED WITH FISH

Turtles. Both fresh- and salt-water turtles are used. The green turtles grow to an enormous size, some weighing from 50 to 100 pounds. They are used principally for making soups, some of the flesh being included in the soup. No work has been done on the vitamin or mineral content.

Terrapins. Terrapins are found in fresh and salt water and are shipped from the South packed in seaweed. They are in season from November to April. Like the lobster, they are cooked alive. Because of the scarcity of terrapin and the increased cost (from two to seven dollars each), they are used very little. The diamond-back terrapin is the most famous variety. Only the female is used for food, the choicest or "full cow" terrapin containing eggs. Terrapin is prized for its delicate flavor rather than for its food value.

Frogs' Legs. Frogs' legs are utilized in some parts of the United States, only the hind legs being eaten. They are easily digested and have a very delicate flavor, much like the white meat of chicken. They are served broiled or fried.

DIGESTIBILITY

Fish, in general, is easily digested because of its short and tender muscle fibers. The controlling factor of digestibility as far as fish flesh is concerned is its fat content; in the richer varieties the fat delays food passage through the stomach, which may be an important consideration in some dietary conditions. If fish low in fat is desirable, charts of "approximate composition" may be consulted. The method of preparation may also be a factor in digestibility, especially when fat is not well tolerated.

Shellfish vary greatly in the rapidity with which they are digested. Oysters are among the most valued foods for the invalid because they digest easily. Lobster is seldom used in the invalid diet because of the coarseness of the meat and the strong flavor. Other shellfish are usually well tolerated, although there may be allergies toward one or more of the members of the shellfish family and occasionally to other types of fish as well.

PLACE IN THE MENU

Fish and shellfish may be used to advantage in the invalid's diet if the patient likes this type of food. The texture of fish is so tender that it may be introduced as soon as solid food is allowed. Fish such as salmon and shad, whose flesh contains fat, is sometimes reserved for later use. Oysters are used more than any other shellfish, although clams, crabmeat and shrimp will offer a desirable variety during the latter part of convalescence. Lobster may have a place on a tray prepared for a convalescent patient under no dietary restrictions.

SELECTION AND CARE OF FISH

Fish is offered on the market today in a number of different forms. Coastal cities and regions bordering on the Great Lakes are well supplied with fresh fish, which is carefully packed in ice for distribution. Fish frozen quickly near its source is kept in cold storage until there is a demand for it. In addition, fish fillets packed in cartons before freezing are available in many markets. Frozen fish should not be defrosted until just before it is to be used. When this is done at market, the test for frozen, as well as for fresh, fish should be firm flesh and lack of a strong odor. Fish should be stored in a covered utensil in the refrigerator. When frozen fish is bought in cartons of family size, it should be allowed to thaw on the shelf of the refrigerator or at room temperature for a number of hours, then cooked promptly. Cartons which arrive in the home kitchen frozen hard may be stored in the freezing unit of the refrigerator to remain until required. Canned fish should be stored in a dry, cool place, and the cans should not be opened until just before the fish is to be used. Quantities of fish are still prepared for shipping by the oldest methods of food preservation—drying, smoking, salting and pickling. By such methods fish will keep in good condition a long time. Fish so treated is generally purchased just before it is to be used, although it may be kept at home when good storage conditions are available.

FISH RECIPES

The general rule for cooking fish may be summed up in one sentence: Short cooking just before serving is most important. This rule is particularly applicable in the case of broiled and pan-broiled fish, which after cooking dries out quickly. The test for cooking is simple. When tried with a fork, the flesh should flake. Sliced or quartered lemon is the chosen garnish for fish for both appearance and flavor. If a sauce is used, it should be flavored either with lemon or some other pungent ingredient.

Fish, Baked Fillets

Procedure: Wash fish fillet and wipe with cloth. Dip in milk, sprinkle with salt and roll in fine, dry bread crumbs or rolled cornflakes. Place in a small, greased baking pan, sprinkle with melted butter or salad oil and bake in a very hot oven (500° F.) 10 minutes or until well browned. Serve with tartare sauce in a lettuce cup, if desired, and lemon quarter.

To make tartare sauce: Mix 1 teaspoon finely minced olives or pickles and a few drops onion juice with 1 tablespoon mayonnaise.

Broiled Fish

Procedure: Wash fish thoroughly, wipe with cloth. Brush with melted butter or salad oil, sprinkle with salt and pepper. Place skin side down on well-greased broiler rack, broil 2 inches from heat from 10 to 15 minutes (until brown). The flesh should flake when tried with a fork. Serve with melted butter and sliced lemon. Allow 1 small fish or ⅓ lb. fish fillet for each serving.

Pan-broiled Fish

Procedure: Wash fish thoroughly and wipe with cloth. Roll in seasoned flour, corn meal or fine dry crumbs. Melt 1 tablespoon butter or bacon fat in a small heavy frying pan and sauté fish over moderate heat until brown on one side. Turn with a pancake turner and brown the other side. Allow from 8 to 10 minutes for cooking. Dress with melted butter or minced parsley.

Poached Fish (Boiled Fish)

Ingredients:
- 1 teaspoon butter
- 1 teaspoon chopped celery
- 1 teaspoon chopped carrot
- 1 sliced onion
- 1 peppercorn
- ½ teaspoon salt
- 1 teaspoon vinegar
- 2 cups water
- ⅓ pound fish fillet

Procedure: Melt butter, add vegetables and cook ½ minute. Add seasonings, vinegar and water. Cover and bring to boiling point. Boil 5 minutes. Wash fish, tie in cheesecloth, place in water and let simmer from 20 to 30 minutes, until fish flakes when tried with a fork. Remove from cheesecloth and drain. Serve with egg, cheese or hollandaise sauce (see Sauces for Vegetables, p. 547) or chill and flake for use in recipes for creamed or scalloped fish (see below). Yield: 1 generous serving.

Egg Sauce for Fish

Ingredients:
- 1 tablespoon butter or margarine
- 1 tablespoon flour
- ⅓ cup fish stock
- ¼ cup sweet or sour cream
- 2 teaspoons lemon juice
- ½ hard-cooked egg
- 1 teaspoon minced parsley

Procedure: Melt butter or margarine in small saucepan, stir in flour. When well blended, stir in the stock. Continue stirring over low heat until mixture thickens slightly. Add cream and stir until sauce boils. Add lemon juice and hard-cooked egg white cut into pieces. Add salt, if needed. Reheat and pour over poached fish fillet. Sprinkle with sieved hard-cooked egg yolk and minced parsley.

Note: Milk may replace the cream if a less rich sauce is desired.

Creamed Fish

Ingredients:
- 1½ tablespoons butter
- 1½ tablespoons flour
- ¼ teaspoon salt
- Pepper
- ¾ cup top milk
- ½ cup flaked fish
- Nutmeg
- 1 tablespoon minced parsley or chives

Procedure: Leftover cooked fish or canned tuna fish, salmon, crabmeat or shrimp may be used. Melt butter, stir in flour, salt and pepper. When well blended, add milk slowly, stirring constantly over low heat until the mixture thickens and boils. Add fish, nutmeg and more salt if necessary. One teaspoon lemon juice may be added if desired. Reheat, serve on toast or in patty shell. Sprinkle with minced parsley or chives. Yield: 2 servings.

Creamed Fish with Mushrooms

Procedure: Follow directions for creamed fish (see above), adding 2 tablespoons sliced cooked or canned mushrooms with the fish.

Codfish, Creamed

Ingredients:

⅛ cup salt codfish
⅛ cup cream sauce (p. 547)

Procedure: Soak codfish in cold water 20 minutes to remove some of the salt; drain. Cut in small pieces and combine with cream sauce, from which salt has been omitted, and heat thoroughly. Yield: 1 serving.

Scalloped Fish

Ingredients:

2 tablespoons butter
1 cup soft bread crumbs
¼ teaspoon salt
Pepper
2 teaspoons lemon juice
⅓ cup flaked cooked or canned fish

Procedure: Leftover cooked fish or drained canned tuna fish or salmon may be used. Melt butter, add crumbs and stir with a fork until well mixed. Add salt, pepper and lemon juice. Arrange fish and crumbs in alternate layers in a small, greased baking dish. Bake about 5 minutes in a hot oven (450° F.) until crumbs are golden brown. Yield: 2 servings.

SELECTION AND CARE OF SHELLFISH

Great care must be taken in the handling and the preparation of shellfish for shipment. Lobsters, oysters and clams in the shell are packed in ice and shipped alive to market points. South African rock lobster tails are fast frozen for shipment to distant points. Shucked oysters are packed in metal containers or waxed cartons which should be refrigerated or surrounded with ice. Shucked oysters are also quick frozen after packing in cartons. They should not be thawed until ready to use. Both soft- and hard-shell crabs are shipped alive, but the majority of the meat from the latter is boiled, picked, placed in cans and packed in ice for shipment. Scallops are usually sold in fresh form, although a few are now frozen. All shellfish after purchase should be stored in the refrigerator and used within 24 hours.

SHELLFISH RECIPES

Creamed Oysters

Ingredients:

1½ tablespoons butter
1½ tablespoons flour
¼ teaspoon salt
Pepper
½ cup milk
6 oysters
1 tablespoon diced raw celery

Procedure: Melt butter in a small saucepan, stir in flour, salt and pepper; stir in milk gradually and continue stirring over low heat until sauce thickens and boils. Add drained oysters and celery and cook over low heat about 2 minutes until edges of the oysters curl. Serve on hot toast or in patty shell; garnish with strips of pimiento or minced parsley. Yield: 1 serving.

Panned Oysters

Ingredients:

6 oysters
½ tablespoon butter
Salt
Pepper

Procedure: Drain the oysters, pour into hot dry saucepan and cook, stirring constantly until edges curl. Add butter and seasoning. Serve on toast. Yield: 1 serving.

Scalloped Oysters

Procedure: Follow directions for scalloped fish (on this page), substituting 6 raw oysters for the flaked fish.

Baked Oysters Casino

Ingredients:
- 6 oysters, in shells
- 1 tablespoon finely minced green pepper
- 1 strip bacon, finely minced
- ½ tablespoon lemon juice
- Dash pepper

Procedure: Have raw oysters opened at market. Arrange on half shells on pie plate. Sprinkle each with minced green pepper, minced bacon, lemon juice and pepper. Bake in hot oven (450° F.) about 10 minutes (until edges of oysters curl). Yield.: 1 serving.

Clams, Steamed

Ingredients:
- 1 pint clams
- ½ cup boiling water
- 2 tablespoons butter, melted
- 1 teaspoon lemon juice

Procedure: Scrub clams with brush and wash under running water until sand has been removed. Place in kettle with boiling water, bring to boiling, cover and cook over low heat from about 12 to 15 minutes (until shells open). Serve on a hot platter and cover with a napkin. Mix melted butter with lemon juice. Pour into small cup. Strain clam broth into a bouillon cup. Yield: 1 serving.

Scallops, Baked

Procedure: Wash and drain ¼ lb. scallops. Roll in seasoned fine dry bread crumbs. Arrange in small, greased, shallow baking dish. Sprinkle with melted butter or with 1-inch pieces cut bacon. Bake under broiler about 4 inches from moderate heat about 10 minutes.

Scallops, Scalloped

Procedure: Follow directions for scalloped fish (p. 534), substituting ½ cup whole bay scallops or ½ cup cut sea scallops for the flaked fish.

Shrimps en Brochette

Procedure: Arrange cooked shrimps alternately with 1-inch pieces bacon on metal skewer. Broil about 3 inches from heat for 5 minutes, until bacon is crisp, turning occasionally. Garnish with lemon quarter. Allow 4 or 5 shrimps for 1 serving.

South African Rock Lobster Tails

To Boil: Have ready a kettle of salted boiling water. Remove cellophane from lobster tails. Plunge tails thawed or unthawed into the water. Bring to boiling and continue boiling until meat is no longer transparent: about 1 minute for each ounce of weight should be allowed after water reboils. Drain lobster tails, drench with cold water and cut inner membrane or shell with scissors. Pull out meat with fingers. Tails may be served whole, cold or hot with a sauce, or may be diced and used for Newburg, salads or other dishes. If meat is chilled before dicing, it will cut more easily.

To Broil: Thaw lobster tails. Cut inner membrane or shell at both edges with scissors and remove. Bend tail backwards and crack shell. Place shell side up on rack of preheated broiler, 5 inches below heat. Broil 5 minutes. Turn, spread with butter or margarine and broil 6 to 9 minutes, depending upon size, until meat is tender when tried with a fork.

STUDY QUESTIONS

1. Compare fish and meat for food value and flavor.
2. Name several types of fish that could be used when necessary to keep fat intake low.
3. Which shellfish appear most commonly on the menu? Which are chosen most often for the convalescent diet, and why?
4. Give the principles for the selection and the care of fish.
5. State the principles for cooking fish.

Vegetables

BOTANICAL CLASSIFICATION
FOOD VALUE
DIGESTIBILITY
CANNED VEGETABLES
FROZEN VEGETABLES
DEHYDRATED OR DRIED VEGETABLES
PLACE IN THE MENU
PREPARATION AND COOKING
GENERAL RULES FOR COOKING
TIMETABLE FOR COOKING
DRESSINGS
FLAVORED BUTTERS
SAUCES
MISCELLANEOUS RECIPES

Under the term "vegetables" are grouped foods representing practically every part of edible plants, leaves, stems, seeds and seed pods, flowers, roots, tubers and fruits. The realization that vegetables had an important contribution to make to the diet spurred research work in nutrition and resulted in their being classified under four of the Seven Basic Food groups considered essential for daily use. Under Group 1 are listed all which have a characteristic green or yellow color. In Group 2, salad greens, cabbage and tomatoes are listed with citrus fruits. In the form of legumes, such as dried beans, peas and lentils are classified in Group 5 with meat and other contributors of protein. The remaining vegetables are classified in Group 3 with fruits other than citrus and tomatoes. In addition to their nutritive quality, vegetables are valued because of the variety they give to the diet through texture, flavor, odor and color. (See Chap. 2.)

BOTANICAL CLASSIFICATION

Botanically, vegetables fall into different classifications according to plant structure. However, this does not indicate in general their nutritive value.

Leafy Vegetables. The leafy vegetables—often called green vegetables—contain less than 10 per cent of solid matter. Outstanding members of the group are spinach, cabbage, Brussels sprouts, lettuce and greens of all sorts.

Stem Vegetables. Celery, asparagus, leeks and rhubarb are classed as stem vegetables, although rhubarb is generally considered a fruit because of the need of sugar in its preparation and because of the way in which it is used in the menu. Kohlrabi is a combination of stem and root.

Roots and Tubers. Vegetables which grow underground are classified as roots and tubers. Of these, beets, carrots, salsify, turnips, sweet

potatoes and parsnips are true roots. While potatoes, Jerusalem artichokes and peanuts, the last used almost entirely as nuts, are tubers or underground stems. Onions are actually bulbs.

Flower Vegetables. Cauliflower and broccoli are examples of the flower type of vegetable. The tips of asparagus are flower buds. Brussels sprouts might be classified as a flower or as a leafy vegetable.

Fruits Classed as Vegetables. Vegetables which are essentially the fruits of the plants are tomatoes, peppers, cucumbers, squashes, pumpkins and eggplants.

Seeds and Seed Pods (Legumes). Peas, beans and lentils are classified as legumes. All are found in seed form, encased in pods. Both pods and seeds of young beans are eaten in the form of snap beans. Peas and some beans are shelled and used as green vegetables. In dried form, peas, beans and lentils are largely used and, unlike other vegetables, serve as a meat substitute on account of their high protein content. Soybeans, which are high in both protein and fat, differ from other legumes. Grains which are used for flour and other cereal products are also seeds.

Edible Fungi. The fungi are plants characterized by an entire lack of chlorophyll, the green coloring matter which enables plants to make food from the carbon dioxide of the air. The edible varieties are commonly known as mushrooms; the inedible are popularly called toadstools, especially the injurious ones, many of which are extremely poisonous. Research work in regard to the food value of cultivated mushrooms shows that they contain protein similar to the gliadin of wheat. They provide appreciable amounts of copper and iron and several fractions of the B complex.

FOOD VALUE

In general, vegetables are valued more highly for their vitamin and mineral contributions than for their other nutrients. They differ greatly, however, in these respects, as a comparison of one vegetable with another through consultation with Table No. 1, Part Four, will demonstrate. Green and yellow vegetables are the best sources of carotene, the provitamin A. First on such a list are dandelion greens, carrots, turnip greens, spinach, sweet potatoes, kale, beet greens, collards and mustard greens. Next in order come winter squash, broccoli, chard, lettuce, tomatoes, asparagus, green peas and strings beans. (See Fig. 18, Chap. 7.) White celery and peeled cucumbers are lacking in this vitamin, but Pascal celery probably will be found to be as rich as its color would indicate, and it is already known that unpared cucumbers supply vitamin A.

Vegetables in general are a more important source of ascorbic acid than has been recognized, as almost all contribute at least a small amount. The tomato is the most important source, not only because of its natural high content but because this is not destroyed by the canning process. Because tomatoes are used so much, they are more important in the meal plan than some other vegetables which are not eaten daily but

AVERAGE VITAMIN LOSSES IN THE COOKING OF VEGETABLES
(Per cent loss includes *dissolved* plus *destroyed*)

Vegetable Type	Carotene	Thiamine	Riboflavin	Niacin	Ascorbic Acid
Leafy green	20	25	25	25	45
Other green types (Broccoli, asparagus)	10	10	20	15	25
Yellow types (carrots, sweet potatoes	10	25	..	15	15
White potatoes					
boiled	..	20	25	20	20
baked	..	..	..	..	55
mashed	..	..	..	..	50
Beans and peas					
fresh or frozen	15	20	25	20	40
canned	45	40	35	..	45

which may rate higher in ascorbic-acid content. The best contributors in order of ascorbic acid content are turnip greens, green pepper, broccoli, kale, mustard greens and Brussels sprouts. Cauliflower, spinach and cabbage come next in order. Potatoes, white or sweet, while less high in vitamin C than some of the other vegetables, are used in such quantities that they add materially to the total of the day. This is also true of lettuce and other salad greens when they are used often. (See Fig. 22, Chap. 7.)

As can be seen by consulting Table 1, Part Four, and illustrations in Chapter 8, vegetables supply varying amounts of thiamine, riboflavin and niacin of the B complex group. Again, greens are high on the list as a source. Peas and potatoes also rate well. Even when amounts are small, vegetables as a class play a part in the accumulation of the daily total of the B complex.

Vitamin Loss in Cooking. The losses of vitamins in the cooking of vegetables are exceedingly variable, depending upon the type of vegetable and the method of cooking. Furthermore, available data are meager and difficult to evaluate. The percentage of loss may be reduced materially by cooking in little water only until done and by using the cooking water. To give some idea of the losses to be allowed for, even when preferred methods of cooking are used, the following general estimates have been derived from the Food and Nutrition Board[1] figures. (For the vitamin content of raw and cooked vegetables see Table 1, Part Four.)

Mineral Content. The mineral content of vegetables is significant in the diet. The calcium, the phosphorus and the iron make them as a class useful contributors to the

[1] Food and Nutrition Board, Table of Vitamin Losses in Cooking, 1944.

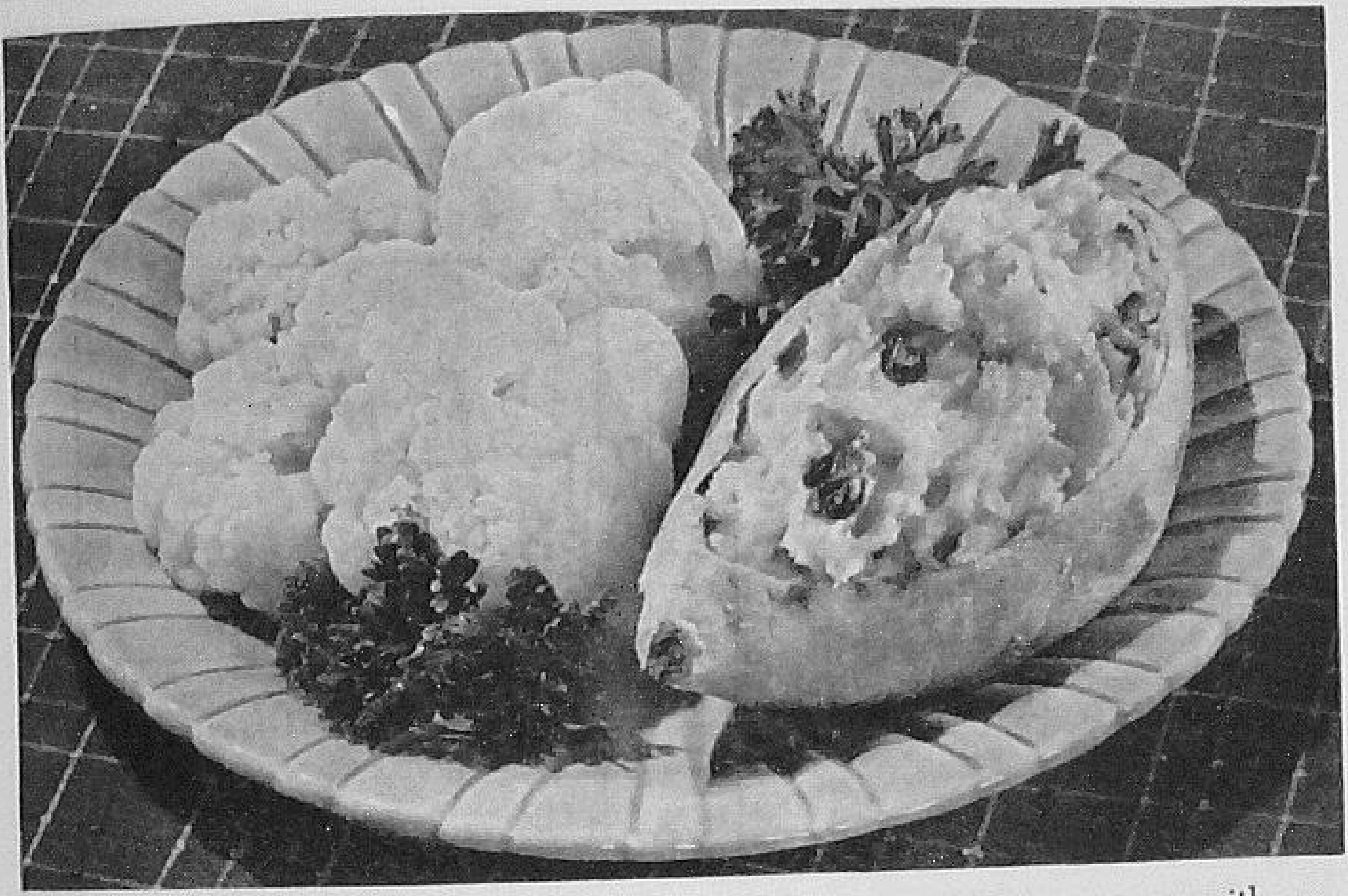


FIG. 109. A vegetable plate showing a golden sweet potato or yam with delicate white cauliflower.

specific needs of the body for these minerals. At the same time, the alkaline residue which they leave after digestion and absorption tends to balance the acid residue of meats and cereals and thus aids in maintaining the neutrality of the blood. Reference to Table 1, Part Four, will show that legumes—under which heading are included dried beans and peas and lentils—have particularly high mineral value. Of course, this will be reduced per serving after they have been soaked and cooked, but they are still good sources. Potatoes, because they are eaten so often, make a larger contribution of minerals than would appear from composition figures.

Leafy green vegetables are naturally high in mineral content, but not all of this is available. Knowledge of the availability is at present inadequate. The utilization of the calcium depends upon the amount of oxalic acid present. While greens score well in the case of iron, it may be only partially available. The mineral content may be influenced by the type of soil in which vegetables are grown. This is illustrated particularly in the case of iodine (see Chap. 7). When vegetables are cooked, there may be some loss of minerals in the cooking water. This is another reason why a minimum amount of water should be used and the vegetable liquor either served with the vegetable or used in a sauce or soup.

Protein is to be found in the dried legumes in a quantity which qualifies them as a substitute for animal protein. However, its quality is not

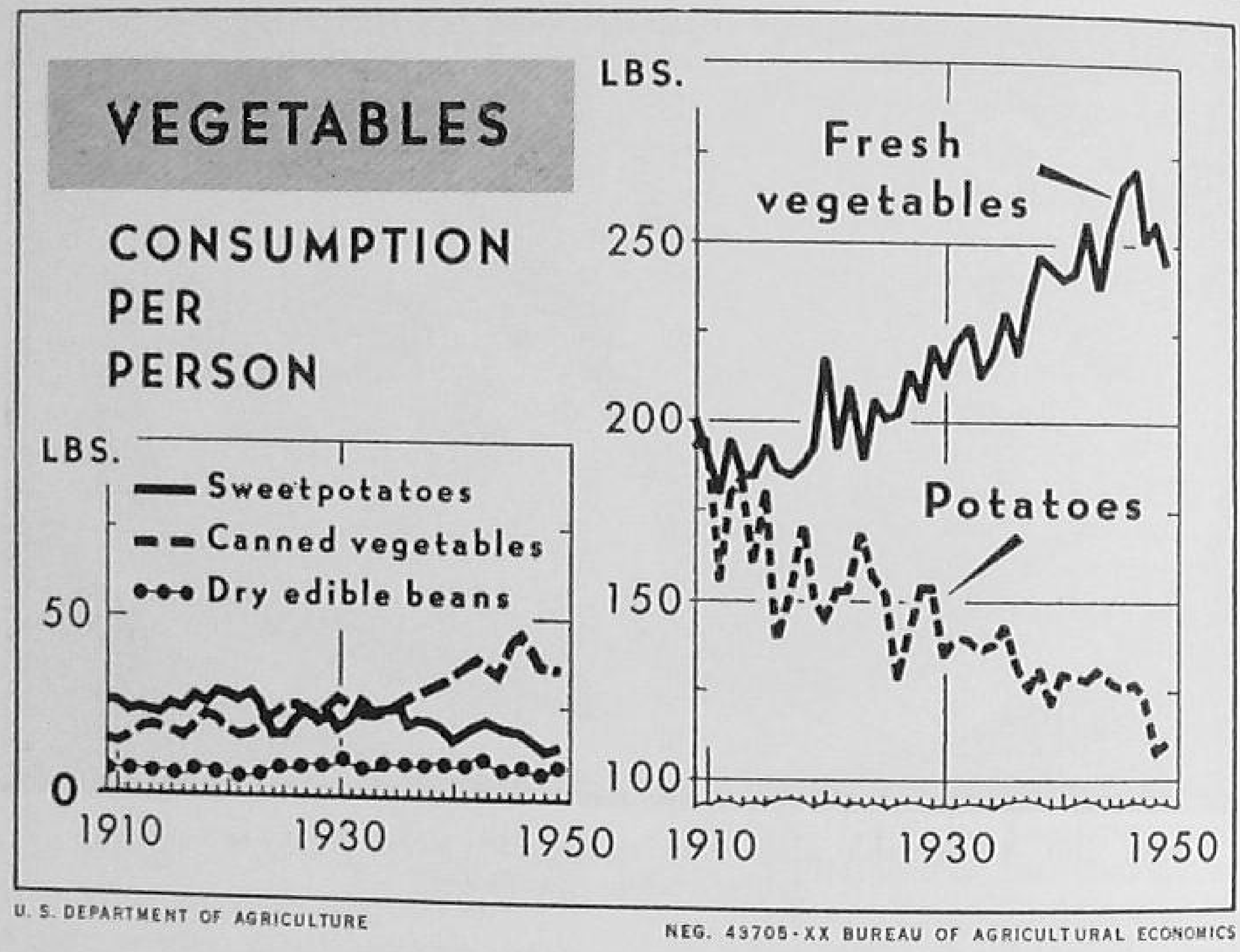


FIG. 110. The per capita consumption of fresh vegetables, including melons, has increased about one sixth since 1909, while the consumption of commercially canned vegetables more than doubled. On the other hand, per capita consumption of potatoes decreased about one third during the period 1909-1943, and sweet potato consumption declined about one fourth.

so high, and it is not so well utilized in the body. Soybeans are in a somewhat different classification, as their caloric value is chiefly in the form of protein and fat, and they are almost starch-free. The quality of the protein is good, and its comparative value is being studied further. While the percentage value of the protein in most fresh vegetables is not high, it is enough to be considered. According to Sherman,[2] "... they show as much or more of their total calories in form of protein as is customary or desirable in ordinary dietaries."

Caloric Value. The caloric value of vegetables is generally in ratio to water content. The range in value is from young fresh greens through potatoes to dry legumes. Except in the case of the legumes, which are comparatively high in protein as well as in carbohydrate, the caloric contribution is generally supplied by the starch content, in which potatoes are particularly high. A few vege-

[2] Sherman, H. C., and Lanford, C. S.: An Introduction to Foods and Nutrition, p. 130, New York, Macmillan, 1943.

tables, notably beets and sweet potatoes, are comparatively rich in sugar. Certain young vegetables, such as peas and corn, have carbohydrate in the form of sugar which changes to starch as the vegetables mature. Available carbohydrate, which is the sum of starch, dextrin and sugar, has been determined for many common vegetables, but data are still incomplete. The percentage of fat in vegetables is very low, except in the case of soybeans.

Almost all vegetables contain large amounts of the nondigestible forms of carbohydrate known as cellulose and hemicellulose, which are useful as bulk in aiding peristalsis. It is often of value to be able to introduce into the intestinal tract a sufficient amount of indigestible residue without unduly increasing the daily caloric intake.

Research work has shown that the food value of vegetables is dependent to some extent upon the type of soil, the methods of fertilization and the varying conditions of the season. Experiments are now being conducted with a view to improving growing methods, and it is hoped that the result eventually will be the production of vegetables higher in vitamin and mineral content than those available today. New and better methods of packing and distributing are also under study. An adequate supply of vegetables gives to the diet what is called "the factor of safety" with reference to vitamins and minerals, but with the many variable conditions affecting quality, the vegetable content of the diet must be abundant in order to be adequate.

DIGESTIBILITY

The normal person can digest vegetables easily. Tender young vegetables are often served raw as relishes or salads. To the standard list of salad vegetables, which includes greens, tomatoes, cucumbers, celery, cabbage, onions and radishes, have now been added thinly sliced carrots, green peppers, turnips and flowerets of cauliflower. However, discretion should be used in offering a convalescent patient salads and relishes of pungent flavor.

Discretion also should be shown in serving cooked vegetables, as some which can be taken under conditions of normal health may cause distress during illness.

Alvarez and Hinshaw,[3] who made a survey of foods that gave distress to their patients, found that the following vegetables were frequently reported as causing "gas, belching, flatulence or distention": onions, cabbage (and other members of the cabbage family), radishes, dried beans, cucumbers and lettuce. Others less frequently reported were melons, tomatoes, corn and peppers. Under certain conditions when roughage must be avoided, it may be necessary to serve vegetables in puréed form. The puréed vegetables designed for feeding infants will be found a convenience in this case.

CANNED VEGETABLES

Canned vegetables provide out-of-season products which contribute practically the same food value as cooked fresh vegetables. Canning factories are distributed throughout

[3] Alvarez, W. C., and Hinshaw, H. C.: J.A.M.A. 104:2053, 1935.

the country in the center of producing districts. The products are picked as soon as they have reached the proper stage and are taken immediately to the factories, where they are cleaned, prepared and packed at once into cans or glass jars, which are then subjected to pressure heat. The scientific methods used for the preservation of perishable foods guarantee that the products will be safe and wholesome.

FROZEN VEGETABLES

Quick-frozen vegetables are now widely accepted as equal or superior in food value to fresh vegetables other than those freshly picked from the garden. Ready as they are for cooking, they have proved to be a great convenience. The distribution of commercial products has widened every year as dealers became convinced that it was worth while to purchase the refrigerated equipment necessary for their storage. In large cities, stores which deal only in frozen products are increasing in numbers. Many towns offer locker facilities where green vegetables and other products may be frozen and stored at the necessary low temperature. There is an increasing use of the home freezer for this purpose by those who raise their own products.

Frozen products, fresh and of good quality, prepared and packed properly for freezing, lose little of their natural food value during storage at the proper temperature.

DEHYDRATED OR DRIED VEGETABLES

Dehydrating by some means of drying is the oldest method of preserving vegetables. Except in the case of the legumes such as peas, beans and lentils, this process had been superseded largely by canning and freezing until war demands for conservation of space in shipment created a new interest in dehydrated products. Many research projects in the interest of preserving flavor, texture and vitamins of vegetables and some fruits were undertaken with varying success. These products were known as dehydrated foods in contrast with dried beans and peas. As with the latter, it is necessary to reconstitute them by soaking in cold water for a specified time before cooking. Demand for these naturally lessened as canned products of every variety again became available. Those on the retail market, such as onions and parsley, are generally used for seasoning purposes.

PLACE IN THE MENU

A well-rounded menu will have vegetables in some form at both mid-day and evening meals. Effort should be made to serve at least two vegetables besides potatoes, one of them in raw form as a salad or relish. In the Seven Basic Food Plan one green or yellow vegetable is suggested for daily use. When a variety of such vegetables is not available, a double portion of any leafy green vegetable in salad form may be used.

PREPARATION AND COOKING

Under modern conditions of growing, shipping and distributing, almost all fresh vegetables can be found in market throughout the year, regardless of season. To supplement the fresh vegetables which

FIG. 111. A vegetable plate with baked potato, hot sliced beets, beet greens garnished with lemon, carrot strips and cottage cheese.

are shipped from the South and the Far West to markets thousands of miles away and the local products which are in season, there are as well the quick-frozen vegetables, the quality and the price of which are stable throughout the year. In addition, there is an ever-increasing variety of canned vegetables. With so much from which to choose there is no reason, except a dislike of certain products, why the menu should not be varied daily so far as vegetables are concerned.

As it may be important to introduce as many vegetables as possible, sometimes a prejudice may be overcome by persuading the patient to taste a vegetable which hitherto has been refused. If the patient has been accustomed to overcooked cabbage, for instance, he may be surprised to find that he likes that crisp light-green or creamy-white vegetable which appears on his tray. On the other hand, one badly cooked vegetable may cause the patient to lose interest in this important asset to diet.

The selection of vegetables for the invalid's tray should be made with reference to the family meals. However, it is possible to buy many vegetables in small quantities and to prepare them especially for the patient.

The care of vegetables in the

home kitchen, for use in either raw or cooked form, is important. The length of time during which they will keep in good condition depends upon the type and the facilities for storage. Root crops, such as turnips, potatoes, carrots and beets, lose their ascorbic-acid content slowly, but preferably they should be kept in a dark, dry, cool place. Large vegetables, such as cabbage, squash and pumpkin, retain their vitamin content better than the leafy vegetables and the small ones such as string beans. Vegetables such as peas and Lima beans should not be shelled until just before they are to be cooked if a large loss is to be avoided. All green vegetables show less loss under refrigeration than under room temperature. Experiments show that when stored in the refrigerator salad greens, celery, young carrots, peas, radishes, parsley, broccoli, cauliflower and tomatoes should be covered, while cucumbers, green and Lima beans, eggplant and summer squash may be left uncovered.

For detailed directions for vegetables to be served raw, see next chapter on salads and relishes.

Vegetables should be washed thoroughly to remove soil and traces of spray. Root vegetables should be scrubbed; asparagus, spinach and other greens should be washed under running water to remove sand. Vegetables such as potatoes and carrots should not be pared or scraped until just before they are to be used. Peas and beans should not be shelled or corn husked until just before they are to be cooked. Outer leaves of cauliflower and cabbage should not be removed until just before they are to be used. In soaking vegetables in salted water to draw out insects, only a few minutes should be allowed. Soaking should be done before cutting or shredding. A larger loss of vitamins occurs when vegetables are cut in small pieces. Grated carrots, for instance, lose vitamins more quickly than the sliced vegetable.

When possible, vegetables should be cooked before they are pared or scraped, although the longer the time necessary for cooking, the greater the loss of minerals and vitamins. Whole potatoes and carrots demand a longer time to cook than those which have been sliced. All vegetables should be cooked as short a time as possible, as long cooking destroys vitamins and changes flavor, color and texture. Only a small amount of water should be used when vegetables are boiled. There will be a very small amount of evaporation if the utensil is tightly covered and if cooking is done over low heat. A heat-proof glass pot will demonstrate this fact, although the same results are achieved by any type of saucepan when the cover really fits. The use of a pressure cooker for cooking vegetables has improved the quality of some of those served on the American table, although for many young green vegetables little time is saved, and the results are no better than when the above directions are followed in using the saucepan.

The use of baking soda in the cooking of green vegetables has been frowned upon by nutritionists, because an alkali such as soda is known to hasten destruction of the vitamins of the B complex and ascorbic acid.

Good cooks also have objected to the use of soda because of the loss of natural flavor and texture. Some research work done at the University of Southern California showed that a very small amount of soda had no effect upon the vitamin content of peas cooked a minimum time which was shortened by the use of the soda. It is not known as yet whether other vegetables react in the same manner. However, the practice of adding soda is not recommended, because both in the home and in institutions, vegetables are apt to stand for a time before being eaten, and if left over and warmed up the soda tends to increase vitamin losses and still further affect flavor and texture.

General Rules for Cooking

1. Use only enough water to cover the bottom of the pan to a depth of ½ inch. (Exceptions to this rule are noted by an asterisk.) Spinach and other tender greens need no water.

2. Bring water to boiling point and add salt before vegetable is added.

3. Cover tightly and cook only until vegetables are tender.

Timetable for Cooking

As vegetables differ in texture according to maturity, directions for cooking time can only be approximate.

Vegetable	*Minutes*
Artichokes	
American or Jerusalem	15-20
*French or Globe	20-30
*Asparagus	15-20
Beans	
String	15-30
Lima	20-30
Beets	20-60
Beet greens	10-20
*Broccoli	15-25
Brussels sprouts	10-20
Cabbage	5-10
Carrots	15-30
Cauliflower	10-30
Celery	10-15
*Corn	5-10
Cucumbers	10-15
Dandelion greens	10-20
Eggplant	10-15
Kohlrabi	20-30
Mushrooms	7-10
Okra	20-25
Onions	20-40
*Parsnips	30-50
Peas	8-15
*Potatoes	
White	20-30
Sweet	20-30
Spinach	6-10
Squash	
Summer	10-20
Winter	20-30
*Turnips	15-60

4. Do not drain the vegetables of mild flavor after cooking, unless the liquid is to be used in the preparation of a sauce.

5. Vegetables may be baked in tightly covered casseroles when the oven is being used for some other purpose. The time of cooking will be about one and a half times again as long as for boiling.

*6. Variations from the general rules: Whole artichokes, cauliflower and cabbage should be placed head up in utensil, and the amount of water should be increased to 1 inch. Stalks of asparagus and broccoli

cook best in a large skillet. The stalks should be arranged side by side in the boiling salted water. The skillet should be covered. For corn on the cob, potatoes, parsnips and turnips, water to a depth of 1 to 2 inches will be needed, depending upon the amount cooked at one time.

7. The use of a small pressure cooker for cooking vegetables will shorten the time. Directions with the utensil should be used.

General Directions for Frozen Vegetables

Frozen vegetables are packed in cartons, and if not to be used within eight hours should be placed in the freezing compartment of the refrigerator, where they will remain solidly frozen. They need not be thawed before cooking. If they have thawed, no attempts to refreeze them should be made. Quick-frozen vegetables may be cooked according to directions for other fresh vegetables. Place in boiling salted water, cover and continue cooking until tender. The time of cooking is generally a little shorter than that indicated for fresh green vegetables.

General Directions for Canned Vegetables

As canned vegetables are already thoroughly cooked, they need only heating and dressing to make them ready for the table. The liquid from the can may be drained and boiled 2 or 3 minutes in order to evaporate some of it. The vegetables may then be heated in this liquid. Canned tomatoes are of course an exception, as they are canned in their own juice.

General Directions for Dried Vegetables

Dried vegetables most commonly used are beans, peas and lentils. In some localities dried mushrooms are obtainable. Most dried vegetables need to be soaked before they are cooked. Any exception to this rule will be noted on the package and the time for cooking given.

DRESSINGS

Vegetables may be dressed with melted butter, brown butter or lemon butter, with cream or with a sauce. Butter and cream are used more often with vegetables than any other dressing. Vegetables cooked in a small amount of water need not be drained. When ready to serve, add 1 or 2 tablespoons butter or margarine or 2 tablespoons cream to each cup of cooked vegetable and reheat. For such vegetables as asparagus, broccoli and artichokes, the sauce often serves as a garnish and is poured over the drained vegetable just before it is served. Sauces of this type may be served in a separate dish if desired.

Flavored Butters

The butter may be melted and combined with lemon juice to taste before the vegetable is dressed. Spinach, string beans, cauliflower, broccoli, asparagus and beets may be dressed with lemon butter. Minced parsley may be added with the butter for dressing potatoes. Cut mint leaves may be used with peas. Butter may be browned slightly in a separate utensil and poured over such vegetables as cauliflower, broccoli or asparagus. A few grated dry

bread crumbs may be browned in butter for dressing cauliflower, broccoli, asparagus and onions.

Sauces

Sauces should blend or contrast in flavor with the vegetable with which they are to be served. They must be smooth and not too thick. When made in a small quantity, a cream sauce may thicken more than is desired. In this case, a little more liquid may be added. A sauce should be served as soon as possible after preparation, but if for any reason it is not, it should be well beaten before being combined with the vegetable.

Cream Sauce

Ingredients:

1 tablespoon butter or margarine
2 teaspoons flour
¼ teaspoon salt
Dash pepper
½ cup milk or milk and vegetable stock

Procedure: Melt butter or margarine in a small saucepan, stir in flour and seasonings. Stir in milk gradually and continue stirring over low heat until sauce thickens and boils. Yield: 3 servings.

Note: Add extra seasoning according to vegetable. This may be minced parsley, minced chives or grated onion, finely chopped celery, grated carrot or lemon juice. For dressing potatoes or macaroni reduce flour to 1½ teaspoons.

Cheese Sauce

Procedure: Follow directions for cream sauce. When sauce has thickened stir in 2 tablespoons grated cheese.

Chestnut Sauce

Procedure: Follow directions for cream sauce. When sauce has thickened add 2 tablespoons cut roasted chestnuts.

Quick Hollandaise Sauce

Procedure: Follow preceding directions for cream sauce. When sauce has thickened combine 2 teaspoons lemon juice with 1 slightly beaten egg yolk and 1 tablespoon butter or margarine and add to sauce, stirring constantly.

Hollandaise Sauce

Ingredients:

1 egg yolk
1 teaspoon lemon juice
¼ cup butter or margarine

Procedure: Place egg yolk in a very small saucepan, add lemon juice and mix thoroughly. Add half the butter or margarine, hold saucepan over a larger pan containing hot, but not boiling, water, and stir vigorously until butter is melted. Add remaining butter, continue stirring until butter is melted and sauce begins to thicken. Remove from heat at once. Yield: 2 servings.

Rich Cheese Sauce

Ingredients:

½ cup processed cheese
2 tablespoons cream
⅛ teaspoon paprika

Procedure: Processed cheese comes in package form under various brand names and melts easily. Combine cheese, cream and paprika in a small saucepan, stir over very low heat until cheese is melted. This recipe may be useful in allergic conditions when neither flour nor milk is allowed. Evaporated milk which can sometimes be taken when there is an allergy toward fresh milk may replace the cream. Yield: 3 servings.

MISCELLANEOUS RECIPES

Creamed Mushrooms

Ingredients:

1 cup (¼ lb.) mushrooms
1 tablespoon butter or margarine
2 teaspoons flour

¼ teaspoon salt
Pepper
½ cup top milk
⅛ teaspoon onion juice

Procedure: Wash mushrooms. Remove stems and slice, discarding tough ends. Peel mushrooms if necessary. Young, tender mushrooms need not be peeled. Slice caps or leave whole. Melt butter or margarine in small frying pan, add mushrooms and cook over low heat about 3 minutes (until tender), stirring occasionally. Stir in flour, salt and pepper. Stir in milk gradually and continue stirring over low heat until mixture thickens and boils. Add onion juice. Serve on hot toast or in croustades (p. 576). Yield: 1 liberal serving or 2 small servings.

Sautéed Mushrooms

Ingredients:
1 cup (¼ lb.) mushrooms
1½ tablespoons butter or margarine
⅛ teaspoon salt
Pepper

Procedure: Prepare mushrooms according to directions in preceding recipe. Melt butter or margarine in small frying pan, add mushrooms and cook over a low heat about 3 minutes (until tender), stirring occasionally. Season with salt and pepper and serve on hot toast. One teaspoon minced onion may be cooked with the mushrooms. Yield: 1 liberal serving.

Buttered Onions

Procedure: Wash and peel 4 white onions. Melt 1 tablespoon butter or margarine in small heavy saucepan, add onions, cover and cook over low heat about 20 minutes (until onions are tender). No seasoning is needed; the flavor of the onions will be sweet and delicate. Yield: 1 serving.

Baked Potatoes

Procedure: Wash and scrub 1 medium-sized or large potato. Grease skin lightly with butter or other fat. Bake on rack of moderately hot oven (425° F.) from 40 to 60 minutes, until potato is soft when pressed with a towel. Remove from oven, break skin open, put a pat of butter or margarine in opening, sprinkle with paprika and serve at once. If there is to be a delay in serving it, cover with cloth and keep in warm place.

Baked Potatoes, Stuffed

Procedure: Bake potato according to directions in preceding recipe. Remove from oven, cut slice from side, scoop out contents with a teaspoon and put through ricer. Add 1 tablespoon butter or margarine and enough hot milk to give a creamy consistency. Add salt and pepper to taste, beat until fluffy and pile lightly in potato shell. Return to hot oven (450° F.) and bake about 10 minutes (until lightly browned). Yield: 1 serving.

Mashed Potatoes

Procedure: Scrub 2 medium-sized or 1 large potato. Boil in salted water until tender. Drain, peel and put through ricer. Add 1 tablespoon butter or margarine and enough hot milk to give a creamy consistency. Add salt and pepper to taste, beat until fluffy and serve at once. Yield: 1 serving.

Stewed Potatoes

Ingredients:
1 tablespoon butter or margarine
¾ cup diced cooked potatoes
¼ cup top milk
Salt, pepper
1 teaspoon minced parsley

Procedure: Melt butter or margarine in small heavy frying pan, add potatoes and stir over low heat until butter is absorbed. Add milk and cook over low heat about 10 minutes until mixture is

thick. Add more milk if necessary. Season to taste with salt and pepper. Sprinkle with parsley. Yield: 1 serving.

Spinach

Procedure: Remove roots and other leaves with sharp knife, place in pan and allow water from faucet to run over leaves. Remove leaves to another pan and repeat process until no sand accumulates in the bottom of the pan. Cook in covered utensil without extra water. When tender, dress without draining or drain and reserve liquid for soup. Cooked spinach may be chopped before dressing with butter or margarine, cream or French dressing or cream sauce.

NOTE: Other greens may be prepared in the same way, a little water being added with the less tender green. If patient must avoid oxalic acid, spinach should be cooked in plenty of boiling water.

Baked Squash

Procedure: Wash, halve and seed one small acorn squash. Brush with butter or margarine or add a few tablespoons cream to each half. Sprinkle with salt and pepper. Place in small baking dish, add water to depth of ½ inch and bake in moderately hot oven (400° F.) 30 minutes until tender. Yield: 2 servings.

Baked Tomatoes

Procedure: Wash 1 medium-sized tomato and cut in half. Arrange halves in baking dish and sprinkle with salt, pepper, sugar, minced onion and chopped parsley. Dot with butter or margarine or small pieces of bacon and bake in moderate oven (350° F.) about 25 minutes (until tender). Yield: 1 serving.

Broiled Tomatoes

Procedure: Prepare tomatoes according to directions in preceding recipe. After seasoning, cover with soft buttered bread crumbs. Broil about 3 inches from medium heat until crumbs are browned. Yield: 1 serving.

Stewed Tomatoes

Procedure: Wash and peel 2 medium-sized tomatoes, cut in quarters and put in small saucepan. Add 1 slice onion and salt, pepper and sugar to taste. Cook over low heat about 10 minutes and add 1 tablespoon butter or margarine. One half cup of croutons (p. 576) may be added just before serving. One cup of canned tomatoes may replace the fresh tomatoes. Yield: 1 serving.

STUDY QUESTIONS

1. Is the botanical classification of vegetables an indication of food value?
2. What are the most valuable contributions vegetables make to the diet? List the vegetables in order of ascorbic acid content.
3. Discuss the losses of vitamins from vegetables due to cooking.
4. Compare the nutritive contributions of fresh, canned and frozen vegetables.
5. What care should vegetables be given in the home kitchen? In storage? In preparation for cooking?
6. Give the general rules for cooking vegetables and the reasons for the accepted method.

CHAPTER FORTY-SIX

Salads and Relishes

LEAFY VEGETABLES IN SALADS
OTHER SALAD VEGETABLES
SALAD COMBINATIONS
SALAD DRESSINGS
SALADS AND RELISHES IN THE MENU
PREPARATION OF RELISHES
RECIPES FOR SALADS
RECIPES FOR SALAD DRESSINGS

The term "salad" now covers innumerable combinations of vegetables, fruits and other food materials which are served crisp and cold with a dressing.

Salads may be divided into two classes. In the first are those which act as appetizers or savories. Except for the dressing served with them, they have little fuel value but are important from the point of view of minerals and vitamins, in which raw fruits and vegetables are particularly high. (See Chaps. 39 and 45.) In the second are those of high nutritive value and protein content from fish, meat, eggs, cheese and nuts which are combined with lighter fruits and vegetables. The latter may be used as the main course for luncheon, but they seldom appear on the dinner table.

A mixed green salad may be served on a chilled plate or in a chilled bowl. Small wooden salad bowls are now obtainable. The dressing may be served in a small pitcher and combined with the salad after the tray has been taken to the patient's room, or the dressing may be mixed with the greens just before the salad is put into the bowl.

Salads made of mixed vegetables and of fruits garnished with salad greens may be served on a salad plate.

Mayonnaise should be placed on top of a mixed vegetable or a fruit salad rather than mixed with it.

The term "relish" is used to describe raw vegetables such as celery, radishes, carrot strips and others which are served without a dressing. They may replace the salad or they may be served in addition with the soup or with the main course. For the invalid tray, relishes may be arranged on the bread and butter plate.

LEAFY VEGETABLES IN SALADS

The most popular and plentiful of the salad plants is lettuce, but there are many other delicious succulent leaves, which, when they can be obtained, may be used to take its place. The quality of lettuce which can be obtained all the year round in almost all sections of the country has improved enormously in the last few years, for its growing popularity has given it a greater market value. Boston and iceberg lettuce, the most

plentiful, are different in flavor and in texture, and equally satisfactory to serve as salads. Romaine, escarole, Chinese cabbage, endive of two types and water cress are other greens which should be considered when they are in the market. The leaves of raw spinach and tender young Swiss chard, sorrel, field grass and dandelion greens are other suggestions. Usually the choice is governed by taste and the grades which are available at the time the purchase is made.

It has been the custom to discard the outer green leaves, which are not so tender and crisp as the inner bleached leaves. It has been shown, however, that these green leaves have a higher vitamin content, and where they are in good condition they should be used. Shredded for sandwiches or used as a basis for other ingredients, they are acceptable. Shredded lettuce sandwiches usually are attractive to children and invalids for luncheon.

To prepare lettuce and other greens for serving, wash the heads in several waters, pulling the leaves apart; shake off as much water as possible and place in a tightly covered container or a plastic bag, or wrap in a towel or sheet of cellophane or foil. Place in refrigerator in a cold place (but above freezing temperature) and allow to crisp for at least an hour. Greens will keep fresh and in good condition for a number of days under this treatment.

OTHER SALAD VEGETABLES

Cabbage is a favorite ingredient for salad. It is also often used by itself and when mixed with a cooked dressing is known as cole slaw. It may be served on bright green salad leaves or garnished with strips of green pepper or pimiento to add a note of color. To prepare, wash the head, remove outer leaves and immerse the head in cold salted water for a short time. Drain well before shredding. Red cabbage may replace or be mixed with the staple white or green cabbage.

Cucumbers are used as an ingredient of a mixed green salad or they may be sliced and served with French or sour-cream dressing. Minced onions or chives are generally used in combination with cucumbers. To prepare, wash before placing in refrigerator. If chilled thoroughly, it is not necessary to crisp in salted water after slicing. Cucumbers may be served pared or unpared.

Tomatoes are also used as an ingredient of a mixed salad or they may be served in sliced form with a French dressing. Sometimes the whole tomato, from which some of the pulp has been removed, is stuffed with a mixed vegetable salad. To prepare, wash and place in the refrigerator to chill, or remove skins by plunging into boiling water before chilling in refrigerator. They may be cut in quarters or sliced and marinated in French dressing before being chilled.

Celery in diced form is often used as an ingredient in a salad. Until time to use, the partially trimmed stalks should be kept wrapped or covered in refrigerator.

Carrots are becoming a favorite as an ingredient of a salad. Young carrots, after the removal of part of the tops, should be covered and placed in the refrigerator. They should be scraped and cut just be-

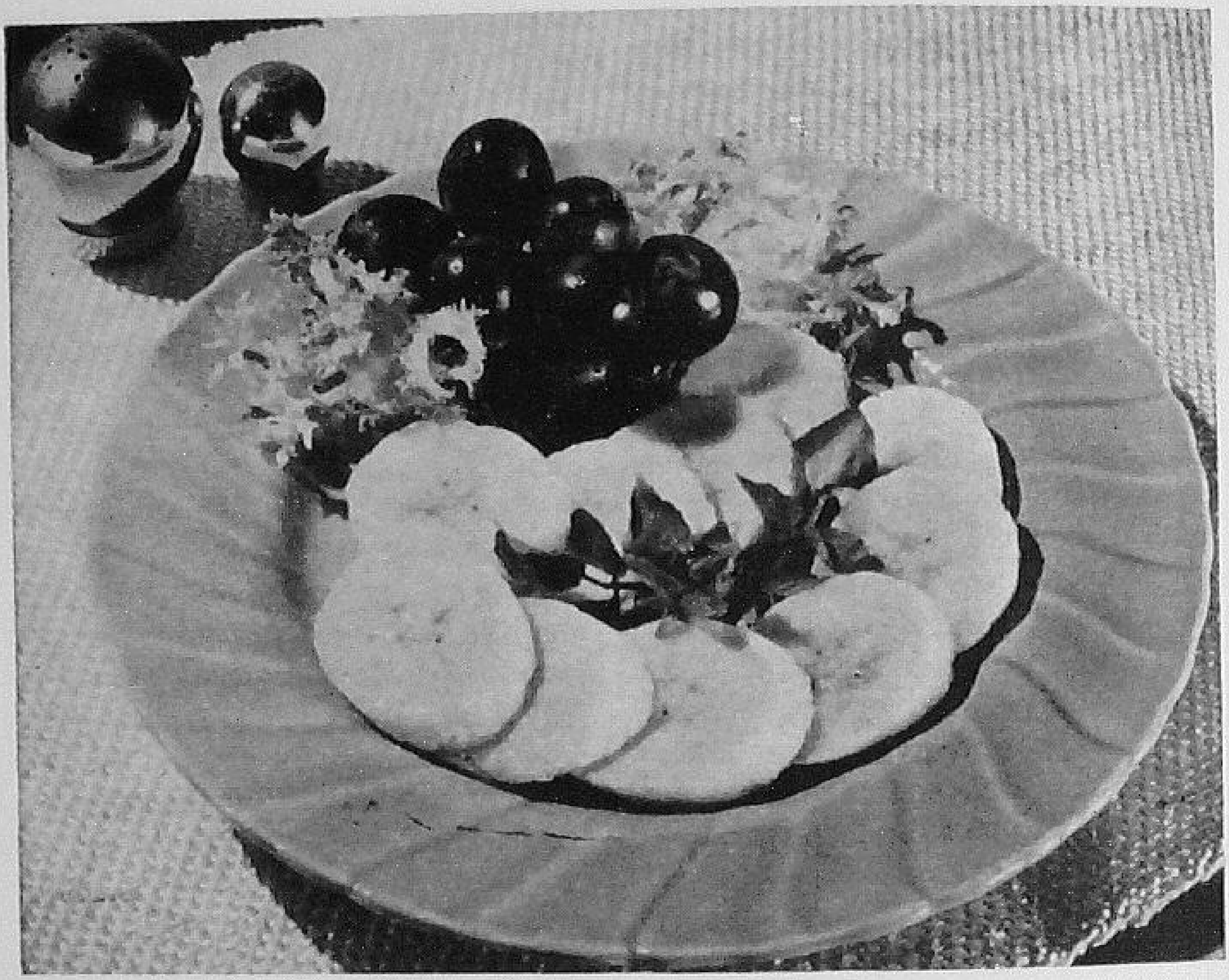


FIG. 112. An attractive fruit salad combination.

fore they are to be used. Carrot strips are often used as a garnish for other salads.

Other Salad Ingredients. Finely cut sticks of yellow or white turnip, cauliflower, green pepper and American artichokes in raw form are sometimes used in mixed salads. Many leftover cooked vegetables such as carrots, string beans, peas or cauliflower may also be used. Cooked spinach mixed with a well-seasoned French dressing may be pressed into small molds, chilled in the refrigerator and served on a bed of salad greens.

Substitutes for Salads. Raw vegetables may be served as relishes rather than in salads. This may be desirable when rich food must be avoided. Tender hearts of celery, crisp radishes and carrot sticks are most commonly used. Flowerets of cauliflower, strips of turnips and young scallions may also be used if allowed.

SALAD COMBINATIONS

The simplest and best salads which will be most used in the diet of an invalid are the green leaves served with a dressing of some type. Where possible, variations in the kind of leaves served should be made. Romaine, endive of either type, or water cress should appear occasionally on the tray. Cabbage, if finely

cut, may also be used and should find favor because it is the cheapest green vegetable during most of the year. A variation in the garnish, a ring of green pepper or pimiento, a brightly colored radish or a piece of beet shaped attractively will suggest variety, even when the basis of the salad is the same.

Fruit Salads. When fruits are used for salad, care should be taken in their combination. Usually salads are more appetizing when few varieties are used in the same combination. Grapefruit and white grapes with a cherry garnish, orange and date, or grapefruit and melon are more attractive both to sight and to taste than a mixture of all of them.

Heavier Salads. When the heavier salads are used as main dishes for lunch or supper, cheese and eggs are often recommended. Meat or fish, mixed with mayonnaise or cooked dressing, makes a combination which may be too rich for some patients. A stuffed egg, a mold of cottage or cream cheese accompanied by a mixed vegetable salad or by the green leaves alone, is usually well liked. A small amount of mayonnaise may be used as a garnish when it is allowed.

Gelatin Salads. Gelatin combined with tomato or fruit juices provides a means of putting extra vegetables and fruits into the diet. Gelatin salads are usually liked and give variety and attractiveness to the invalid's tray.

SALAD DRESSINGS

French dressing is used more often for invalids than any other kind. This is a simple combination of oil, vinegar or lemon juice and seasonings. Olive oil is considered best for the preparation of dressing, but some people do not care for its flavor. During World War II it was replaced entirely by a salad oil made from corn, cottonseed, peanuts or soy. These oils are generally of bland flavor and have better keeping qualities than olive oil. Care must be taken to keep the oil as nearly airtight as possible and in a cool place. If the bottle is clear glass, keeping it in a dark place is an added precaution against rancidity. Rancid oil served even once by mistake may cause an invalid to refuse to take salad again, and thus make it more difficult to introduce the proper amounts of fruits and vegetables into the diet. After the bottle or can has been used, the top should be wiped carefully.

Oil is also an asset when a diet of high nutritive value is necessary. Mineral oil should not be used in a salad dressing, as it inhibits the absorption of the fat-soluble vitamins A, D, E and K. Because it has no caloric value, it was often used in both French dressing and mayonnaise for the reducing diet. Salad dressing should be savory, but not overseasoned with condiments, particularly for invalids. If vinegar is forbidden, lemon juice may be substituted for it in most dressings. If oil is forbidden or not liked, lemon juice by itself or mixed with orange juice will give a desirable flavor.

Mayonnaise, an emulsion of oil, egg yolks and acid, should usually be thinned with lemon juice rather than with vinegar. A little catsup or chili sauce added to mayonnaise may be used instead of other seasoning

as a variation. It gives color as well as savor to the salad.

Sour-Cream Dressing. There is no dressing more useful in the invalid's diet than sour-cream dressing. It is generally liked and can be taken easily in most cases. Sour cream should be purchased as such, as unfavorable bacteria instead of the lactic-acid type may develop in pasteurized cream kept under home conditions. Whipped sweet cream may replace sour cream, if an extra amount of vinegar is added to the recipe (see p. 559).

Cooked Dressing. A cooked dressing often known as a boiled dressing, although it should be made in a double boiler, is particularly appropriate for potato and cabbage salad and may be preferred as a dressing for greens. A cooked dressing with a fruit-juice base is a good choice for use with fruit.

SALADS AND RELISHES IN THE MENU

Through the use of salads and relishes, both the nutritive quality and the attractiveness of the meal can be improved. Salad greens are used either as an ingredient or as a garnish for every type of salad. The use of relishes instead of or in addition to salad is a means of serving vegetables in raw form, in which they contribute practically all their natural vitamin and mineral content.

Through different combinations of fruits and vegetables and through serving them in jellied form with salad greens there can always be variety in both flavor and appearance. If the patient prefers a mixed green salad and welcomes its appearance daily, there is no reason why it should not be served. Different dressings may be served, or the standard French dressing may appear daily, according to the taste of the patient.

The following standards will be helpful in preparing salads. The first three standards apply to relishes also:

1. They should be cold and crisp.
2. They should be attractive to the eye.
3. They should be simple rather than elaborate.
4. They should have a dressing which is well but moderately seasoned.
5. They should be varied either as to combination or to dressing from day to day.

Preparation of Relishes

Celery, radishes and carrot strips are the relishes most used. Scallions, flowerets of raw cauliflower, strips of young turnip and green pepper and thin wedges of cucumber may also be used. The hearts of celery are generally chosen for the invalid's tray, although the outer stalks of the green Pascal celery are tender enough to be acceptable. Cut stalks of celery may be stuffed with a flavored cottage or cream cheese or with a blend of a highly flavored cheese with cream or cottage cheese.

All vegetables should be washed carefully and trimmed. Carrots should be scraped before being sliced into thin strips. Although it is customary to soak these vegetables for half an hour or more in salted water, some of the nutrients

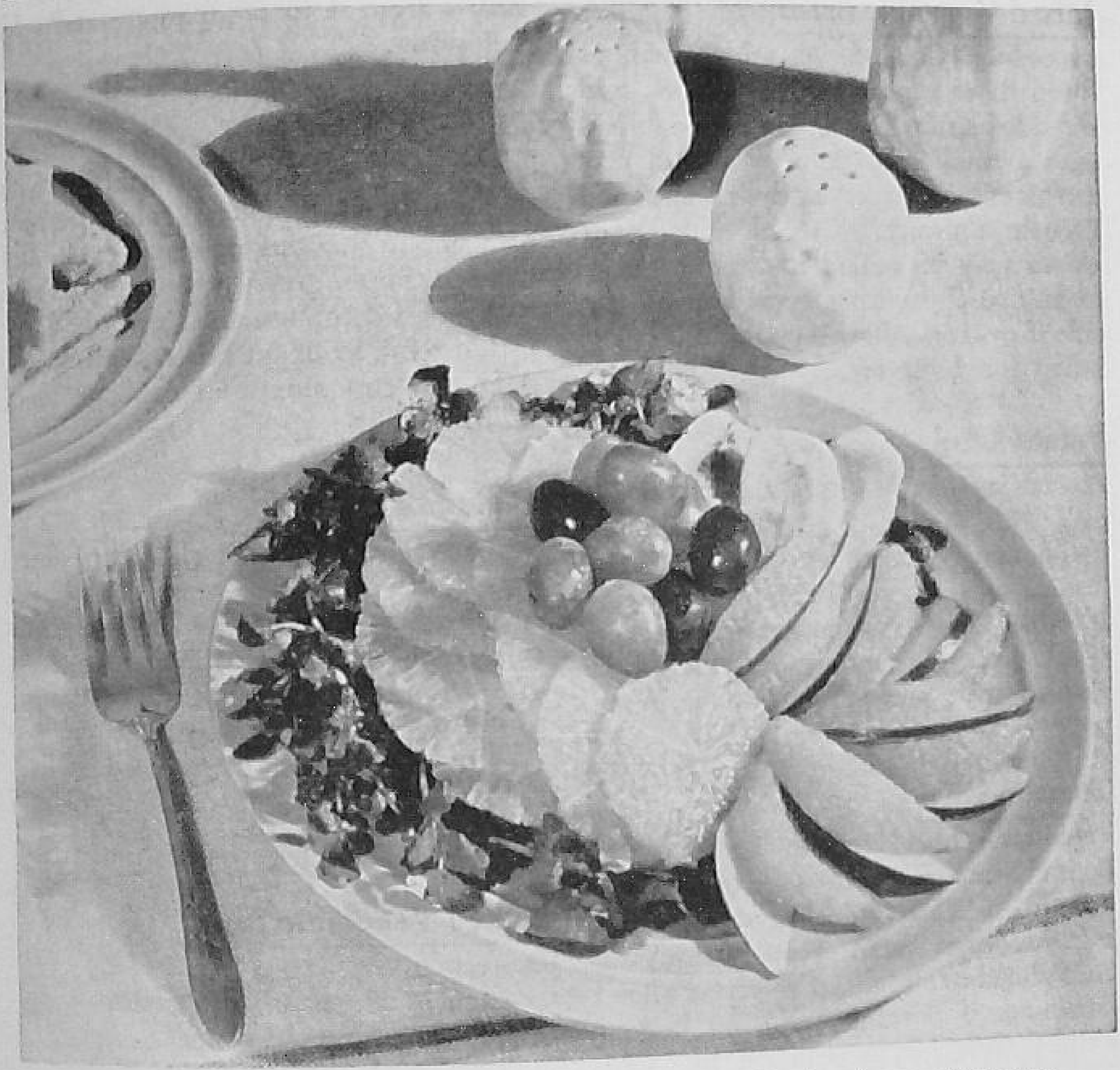


Fig. 113. Fruit salad plate may be a good choice for luncheon or supper.

may be lost. This will also be the case when they are allowed to stand after they have been prepared. Vegetables to be served as relishes should preferably be prepared just before they are to be used. If it is necessary to prepare them earlier, they should be placed in a covered dish in the refrigerator. As relishes are more appetizing when chilled, there may be a good reason for preparing them an hour or two before serving. A salt shaker on the invalid's tray should accompany relishes.

RECIPES FOR SALADS

Vegetable Salads

Mixed Green Salad

Procedure: Crisp lettuce, romaine or other salad greens may be combined with any raw vegetable such as sliced cucumbers, radishes, sliced onions, shredded carrots, cabbage, green pepper or sliced skinned tomatoes. The ingredients must all be crisp and cold and tossed with French dressing just before they are served. For preparation of cucumbers and tomatoes see cucumber salad and tomato salad (p. 551).

Mixed Vegetable Salad

Procedure: Cooked vegetables such as diced beets, peas, Lima beans and shredded string beans may be combined with a small amount of shredded raw carrots or diced celery and well-seasoned French dressing. Minced onions or chives may be added if desired. Serve in lettuce cup with mayonnaise on the side if desired. Allow ½ cup mixed vegetables for 1 serving.

Potato Salad

Procedure: Mix ½ cup cold diced potatoes with ¼ cup diced celery, 1 teaspoon minced onion and 1 tablespoon French dressing. Just before serving add 1 tablespoon mayonnaise or cooked salad dressing. Serve on lettuce and garnish with minced parsley or green pepper. Yield: 1 serving.

Tomato Salad

Procedure: Scald tomato 1 minute in boiling water. Drench with cold water and drain. Peel and slice or cut into eighths, dress with French dressing. Add sliced onion, diced celery or sliced cucumber if desired. Serve on bed of lettuce with mayonnaise on the side. Yield: 1 serving.

Small skinned tomatoes may be cut in quarters and almost to stem end and arranged on lettuce. The tomato cup may be filled with mixed vegetable, chicken or fish salad.

A slice may be removed from the stem end and the center pulp removed, in which case fill center with any fish, meat or vegetable salad. Serve on lettuce and garnish with mayonnaise.

Asparagus Salad

Procedure: Arrange drained and chilled cooked or canned asparagus on bed of lettuce or romaine. Sprinkle with French dressing and garnish with strips of pimiento. Grated cheese may be sprinkled over the asparagus if desired. Allow from 4 to 6 asparagus stalks for 1 serving.

Cabbage Salad

Procedure: Mix shredded cabbage with French dressing, cooked salad dressing, sour cream dressing or mayonnaise. Add minced onion, green pepper or pimiento to the salad, or use as a garnish. Serve in lettuce cup or on other salad greens. Allow 1 cup shredded cabbage for 1 serving.

Cucumber Salad

Procedure: Wash and chill cucumbers. Pare and slice. If cucumbers have not been chilled they may be placed in salted ice water for about 15 minutes after being sliced, and then drained. Dress with French dressing or sour cream dressing; add minced onions, scallions or chives if desired. Allow ½ cucumber for 1 serving.

Jellied Vegetable Salad

Ingredients:

1 teaspoon granulated gelatin
1 tablespoon cold water
⅓ cup boiling water
2 teaspoons sugar
⅛ teaspoon salt
1 tablespoon lemon juice or mild vinegar
½ cup finely diced celery
2 teaspoons chopped green pepper
2 teaspoons chopped pimiento

Procedure: Soften gelatin in cold water and dissolve in boiling water. Add sugar and salt, stir until dissolved. Chill until mixture begins to thicken. Stir in lemon juice or vinegar and vegetables and pour into 2 small molds. Chill until set. Unmold on salad plate and garnish with lettuce or other salad greens. Serve mayonnaise on the side. Yield: 2 servings.

Note: Shredded cabbage may replace part or all of the celery.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca. mg.	P. mg.	Fe. mg.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Fish:									
Bluefish:									
Raw	100	23	243	.6	—	.12	(.09)	1.9	—
Baked	100	23	293	.7	—	.12	.11	2.2	—
Fried	100	19	243	.6	—	.11	.11	2.1	—
Cod:									
Raw	100	10	194	.4	0	.06	.09	2.2	2
Dried	100	(50)	891	3.6	0	.08	.45	10.9	0
Flounder, raw	100	61	195	.8	—	.06	.05	1.7	—
Haddock:									
Raw	100	23	197	.7	—	.05	.08	2.4	—
Fried	100	18	182	.6	—	.04	.09	2.6	—
Halibut:									
Raw	100	13	211	.7	440	.07	.06	9.2	—
Broiled	100	14	267	.8	—	.06	.07	10.5	—
Herring:									
Atlantic, raw	100	—	256	1.1	110	.02	.15	3.4	—
Pacific, raw	100	—	—	—	100	.02	.22	(2.2)	—
Smoked, kippered	100	66	254	(1.4)	0	Tr.	.28	(2.9)	—
Mackerel:									
Atlantic:									
Raw	100	5	239	1.0	(450)	.15	.35	8.4	—
Canned	100	185	274	2.1	430	.06	.21	5.8	—
Pacific, canned	100	260	288	2.2	30	.03	.33	8.8	—
Salmon:									
Raw Pacific	100	—	(289)	(.9)	310	.10	.23	7.2	9
Cooked Pacific	100	—	(417)	(1.2)	—	.10	.28	8.1	—
Canned:†									
Chinook, King	100	154	289	.9	230	.03	.14	7.3	0
Pink, humpback	100	187	286	.8	70	.03	.18	8.0	0
Sockeye, red	100	259	344	1.2	230	.04	.16	7.3	0
Sardines:									
Atlantic type, drained solids	100	386	586	2.7	220	.02	.17	4.8	0
Pacific type:									
Natural pack	100	(381)	(168)	4.1	(30)	(.01)	(.30)	(7.4)	0
Tomato sauce	100	381	168	4.1	30	.01	.27	5.3	0

Tr. See footnote on page 628.
Note: Parentheses indicate imputed value.
†If bones are discarded, calcium content would be much lower. Bones equal about 2 per cent of total contents of can.

Table 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Shad, raw	100	3½ ozs.	168	19	10	0	0	70
Swordfish:								
Raw	100	3½ ozs.	118	19	4	0	0	76
Broiled	100	3½ ozs.	178	27	7	0	0	65
Tuna fish, drained solids	100	3½ ozs.	198	29	8	0	0	60
Frog legs, raw	100	3½ ozs.	73	16	Tr.	0	0	82
Fruit cocktail, canned, solids and liquids	100	½ c. scant	70	Tr.	Tr.	19	.4	81
Gelatin, dry:								
Plain	100	⅔ c.	335	86	Tr.	0	0	13
	10	1 tbsp.	34	9	0	0	0	1
Dessert powder	90	3-oz. pkg.	324	8	Tr.	76	0	1
Gelatin dessert,* ready to serve:								
Plain	100	½ c. heaping	65	2	0	15	0	83
With fruit added	100	½ c. heaping	71	1	Tr.	18	.2	81
Gingerbread*	100	2 pieces, 2x2x2 in.	327	4	12	52	.1	30
Grapefruit:								
Raw	100	½ small	40	1	Tr.	10	.3	89
Canned in sirup, solids and liquid	100	½ c. scant	72	1	Tr.	19	.2	80
Grapefruit juice:								
Fresh or frozen reconst.	100	½ c. scant	36	1	Tr.	9	.1	90
Canned:								
Unsweetened	100	½ c. scant	38	1	Tr.	10	.1	89
Sweetened	100	½ c. scant	52	1	Tr.	14	.1	85
Grapefruit-orange juice blend, canned or frozen reconst.:								
Unsweetened	100	½ c. scant	40	1	Tr.	10	.1	89
Sweetened	100	½ c. scant	52	1	Tr.	14	.1	85

*Values are calculated from a recipe.
Tr. See footnote on page 628.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca. mg.	P. mg.	Fe. mg.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Shad, raw	100	—	260	.5	—	(.15)	.24	(8.4)	—
Swordfish:									
Raw	100	19	195	.9	1,580	.05	.05	9.1	—
Broiled	100	20	251	1.1	2,300	.05	.06	10.3	0
Tuna fish, drained solids	100	(8)	(351)	(1.4)	80	.05	.12	12.8	0
Frog legs, raw	100	18	147	1.1	0	.14	.25	1.2	—
Fruit cocktail, canned	100	9	12	.4	160	.01	.01	.4	2
Gelatin, dry:									
Plain	100	0	0	0	0	0	0	0	0
	10	0	0	0	0	0	0	0	0
Dessert powder	100	0	0	0	0	0	0	0	0
Gelatin dessert, ready to serve:									
Plain	100	0	0	0	0	0	0	0	0
With fruit	100	6	11	.3	110	.03	.02	.2	3
Gingerbread	100	114	71	2.5	100	.04	.08	1.0	0
Grapefruit:									
Raw	100	22	18	.2	Tr.	.04	.02	.2	40
Canned in sirup, solids and liquids	100	13	14	.3	Tr.	.03	.02	.2	30
Grapefruit juice:									
Fresh or frozen	100	8	13	.3	Tr.	.04	.02	.2	40
Canned, unsweetened or sweetened	100	8	12	.3	Tr.	.03	.02	.2	35
Grapefruit-orange juice blend, canned or frozen, unsweetened or sweetened	100	9	15	.3	40	.05	.02	.2	38

Tr. See footnote on page 628.

Note: Parentheses indicate imputed value.

Table 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Grapes, raw:								
American type (slip skin) as Concord, Delaware, Niagara and Scuppernong	100	1 bunch, 3½x3 in.	70	1	1	15	.5	82
European type (adherent skin) as Malaga, muscat, sultanina, Thompson seedless and Tokay	100	⅔ c.	66	1	Tr.	17	.5	82
Grape juice, bottled, commercial	100	3½ ozs.	67	Tr.	0	18	—	81
Guavas, common, raw	100	1 large	70	1	1	17	5.5	81
Heart:								
Beef, lean, raw	100	3½ ozs.	108	17	4	1	0	78
Calf, canned, strained (infant food)	30	1 oz.	23	4	1	Tr.	0	22
Chicken, raw	100	3½ ozs.	157	21	7	2	0	70
Pork, raw	100	3½ ozs.	117	17	5	Tr.	0	77
Honey, strained or extracted	21	1 tbsp.	62	Tr.	0	17	—	4
Honeydew melon, raw	100	wedge 1½x7 in.	32	1	0	7	.4	91
Ice cream, plain	100	¾ c.	207	4	13	21	0	62
	62	1 container 3½ fluid ozs.	129	3	8	13	0	37
Jams, marmalades, preserves	20	1 tbsp.	55	Tr.	Tr.	14	.1	6
Jellies	20	1 tbsp.	50	0	0	13	0	7
Kale, cooked, fresh or frozen	100	1 c.	40	4	1	7	1.2	87

Tr. See footnote on page 628.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals: Ca. mg.	Minerals: P. mg.	Minerals: Fe. mg.	Vitamins: Vitamin A I.U.	Vitamins: Thiamine mg.	Vitamins: Riboflavin mg.	Vitamins: Niacin mg.	Vitamins: Ascorbic Acid mg.
Grapes, raw:									
American type (slip skin)	100	17	21	.6	80	.06	.04	.2	4
European type (adherent skin)	100	17	21	.6	80	.06	.04	.2	4
Grape juice, bottled	100	10	10	.3	—	.04	.05	(.2)	Tr.
Guavas	100	30	29	.7	250	.07	.04	1.2	302
Heart:									
Beef, raw	100	9	203	4.6	30	.58	.89	7.8	6
Calf (infant food)	30	3	43	1.0	—	.02	.23	1.3	—
Chicken, raw	100	23	142	1.7	30	.12	.91	5.2	6
Pork, raw	100	35	132	2.7	30	.43	1.24	6.0	6
Honey	21	1	3	.2	0	Tr.	.01	Tr.	1
Honeydew melon	100	(17)	(16)	(.4)	40	.05	.03	.2	23
Ice cream, plain	100	123	99	.1	520	.04	.19	.1	1
	62	76	61	.1	320	.03	.12	.1	1
Jams, etc.	20	2	2	.1	Tr.	Tr.	Tr.	Tr.	1
Jellies	20	(2)	(2)	(.1)	Tr.	Tr.	Tr.	Tr.	1
Kale, cooked	100	225	62	2.2	8,380	.07	.23	1.7	51

Tr. See footnote on page 628.
Note: Parentheses indicate imputed value.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Kidneys, raw:								
Beef	100	3½ ozs.	141	15	8	1	0	75
Pork	100	3½ ozs.	114	16	5	1	0	77
Sheep	100	3½ ozs.	105	17	3	1	0	78
Kohlrabi:								
Raw	100	¾ c. diced	30	2	Tr.	7	1.1	90
Cooked	100	⅔ c.	30	2	Tr.	7	1.1	90
Lamb:								
Rib chop, cooked	100	3½ ozs.	418	24	35	0	0	40
Shoulder roast cooked	100	3½ ozs.	342	21	28	0	0	50
Leg roast, cooked	100	3½ ozs.	274	24	19	0	0	56
Canned, strained (infant food)	30	1 oz.	30	4	1	0	0	24
Lard	100	½ c.	902	0	100	0	0	0
	14	1 tbsp.	126	0	14	0	0	0
Lemons	100	1 medium 2¾x2 in.	32	1	1	9	.9	89
Lemon juice, fresh and canned unsweetened	100	½ c. scant	24	Tr.	Tr.	8	0	91
Lentils, dry, split	100	3½ ozs.	339	24	1	60	1.7	12
Lettuce, raw, headed and other types	100	4 large leaves	15	1	Tr.	3	.6	95
Limes	100	2 medium	37	1	Tr.	12	(.9)	86
Lime juice, fresh	100	½ c. scant	24	Tr.	0	8	0	91
Liver:								
Beef:								
Raw	100	3½ ozs.	136	20	3	6	0	70
Fried	100	3½ ozs.	208	24	8	10	0	57
Calf, raw	100	3½ ozs.	141	19	5	4	0	71
Chicken, raw	100	3½ ozs.	141	22	4	3	0	70
Pork, raw	100	3½ ozs.	134	20	5	2	0	72
Sheep or lamb, raw	100	3½ ozs.	136	21	4	3	0	71

Tr. See footnote on page 628.
Note: Parentheses indicate imputed value.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca. mg.	P. mg.	Fe. mg.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Kidneys, raw:									
Beef	100	9	221	7.9	1,150	.37	2.55	6.4	13
Pork	100	11	246	8.0	130	.58	1.74	9.8	13
Sheep	100	13	237	9.2	(1,150)	.51	2.42	7.4	13
Kohlrabi:									
Raw	100	46	50	.6	Tr.	.06	.05	.2	61
Cooked	100	46	50	.6	Tr.	.04	.04	.2	37
Lamb:									
Rib chop, cooked	100	11	200	3.0	0	.14	.26	5.6	0
Shoulder roast, cooked	100	9	188	2.6	0	.12	.22	4.6	0
Leg roast, cooked	100	10	257	3.1	0	.14	.25	5.1	0
Canned, strained	30	5	48	.7	0	.01	.07	1.1	0
Lard	100	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0
Lemons	100	40	22	.6	0	.04	Tr.	.1	50
Lemon juice, unsweetened	100	14	11	.1	0	.04	Tr.	.1	50
Lentils, split	100	34	292	7.4	570	.56	.24	2.2	5
Lettuce:									
Headed	100	22	25	.5	540	.04	.08	.2	8
Leaf type	100	62	20	1.1	1,620	.04	.08	.2	18
Limes	100	(40)	(22)	(.6)	0	(.04)	Tr.	(.1)	27
Lime juice	100	(14)	(11)	(.1)	0	(.04)	Tr.	(.1)	27
Liver:									
Beef:									
Raw	100	7	358	6.6	43,900	.26	3.33	13.7	31
Fried	100	8	486	7.8	53,500	.26	3.96	14.8	31
Calf, raw	100	6	343	10.6	22,500	.21	3.12	16.1	36
Chicken, raw	100	16	240	7.4	32,200	.20	2.46	11.8	20
Pork, raw	100	10	362	18.0	14,200	.40	2.98	16.7	23
Sheep or lamb, raw	100	8	364	12.6	50,500	.40	3.28	16.9	33

Tr. See footnote on page 628.
Note: Parentheses indicate imputed value.

Table 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Pro-tein Gm.	Fat Gm.	Carbo-hydrate Total Gm.	Carbo-hydrate Fiber Gm.	Water Gm.
Liver, canned, strained (infant food)	30	1 oz.	30	5	1	Tr.	0	23
Lobster:								
Raw	100	3½ ozs. meat	88	16	2	1	0	79
Canned	100	3½ ozs.	92	18	1	Tr.	0	77
Loganberries, raw	100	⅔ c.	62	1	1	15	1.4	83
Macaroni:								
Unenriched:								
Dry	100	¾ c. elbow type	377	13	1	77	.4	9
Cooked*	100	⅔ c. elbow type	149	5	1	30	.2	61
Enriched:								
Dry	100	¾ c. elbow type	377	13	1	77	.4	9
Cooked*	100	⅔ c. elbow type	149	5	1	30	.2	61
Macaroni and cheese, baked*	100	½ c.	211	8	11	20	.1	58
Mangos, raw	100	½ medium	66	1	Tr.	17	1.0	81
Margarine, fortified	100	½ c. scant	720	1	81	Tr.	0	16
	14	1 tbsp.	101	Tr.	11	Tr.	0	2
Marmalades. See Jams, marmalades, preserves								
Mayonnaise. See Salad dressings								
Meat. See Beef, Lamb, Pork, Veal								
Milk, cow:								
Fluid (pasteurized and raw):								
Whole	100	½ c. scant	68	3.5	4	5	0	87
	244	1 c.	166	8.5	10	12	0	212
Nonfat (skim)	100	½ c. scant	36	3.5	Tr.	5	0	91
	246	1 c.	87	8.6	Tr.	13	0	222

*Values are calculated from a recipe.
Tr. See footnote on page 628.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca. mg.	P. mg.	Fe. mg.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Liver (infant food)	30	7	79	2.0	5,440	.01	.61	1.8	—
Lobster:									
Raw	100	61	184	.6	—	(.13)	.06	(1.9)	—
Canned	100	65	192	.8	—	(.03)	.07	(2.2)	—
Loganberries	100	35	19	1.2	(200)	(.03)	(.07)	(.3)	24
Macaroni:									
Unenriched:									
Dry	100	22	165	1.5	0	.09	.06	2.0	0
Cooked	100	9	65	.6	0	.02	.02	.5	0
Enriched:									
Dry	100	22	165	2.9†	0	.88†	.37†	6.0†	0
Cooked	100	9	65	1.1	0	.17	.10	1.4	0
Macaroni and cheese:									
Unenriched	100	191	169	.5	450	.03	.16	.4	Tr.
Enriched	100	191	169	.7	450	.10	.20	.9	Tr.
Mangos	100	9	13	.2	6,350	.06	.06	.9	41
Margarine	100	20	16	0	3,300	—	—	—	0
	14	3	2	0	460	—	—	—	0
Marmalades. See Jams, marmalades, preserves									
Mayonnaise. See Salad dressings									
Meat. See Beef, Lamb, Pork, Veal									
Milk, cow:									
Fluid (pasteurized and raw):									
Whole	100	118	93	.1	(160)	.04	.17	.1	1
	244	288	227	.2	(390)	.09	.42	.3	3
Nonfat	100	123	97	.1	Tr.	.04	.18	.1	1
	244	303	239	.2	(10)	.09	.44	.3	3

Tr. See footnote on page 628.

Note: Parentheses indicate imputed value.

†Iron, thiamine, riboflavin and niacin are based on the minimum level of enrichment specified under the Food, Drug and Cosmetic Act.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Pro-tein Gm.	Fat Gm.	Carbo-hydrate Total Gm.	Carbo-hydrate Fiber Gm.	Water Gm.
Canned:								
Evaporated (unsweetened)	100	½ c. scant	138	7	8	10	0	74
Condensed (sweetened)	100	⅓ c.	320	8	8	55	0	27
Dried:								
Whole	100	1 c. scant	492	26	27	38	0	4
	8	1 tbsp.	39	2	2	3	0	Tr.
Nonfat solids (skim)	100	1 c. scant	362	36	1	52	0	4
	7½	1 tbsp.	28	3	Tr.	4	0	Tr.
Malted†								
Dry powder	30	1 oz.	115	4	2	20	0	Tr.
Beverage	270	1 cup	281	12	12	32	0	210
Chocolate flavored*	100	½ c. scant	74	3	2	11	0	83
	250	1 c.	185	8	6	27	0	207
Milk, goat, fluid	100	½ c. scant	67	3	4	5	0	87
	244	1 c.	164	8	10	11	0	212
Molasses, cane:								
First extraction or light	100	⅓ c.	252	—	—	65	—	24
Second extraction or medium	100	⅓ c.	232	—	—	60	—	24
Third extraction or black-strap	100	⅓ c.	213	—	—	55	—	24
Muffins, made with enriched flour*	100	2 muffins 2¾-in. diam.	280	8	8	42	.1	37
Mung bean sprouts, raw	100	1 c.	23	3	Tr.	4	.7	92
Mushrooms, canned, solids and liquid	100	½ c.	11	1	Tr.	4	—	93
Mustard greens, cooked	100	⅔ c.	22	2	Tr.	4	.8	92

*Values are calculated from a recipe.
Tr. See footnote on page 628.
†Based on unfortified products.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca. mg.	P. mg.	Fe. mg.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Canned:									
Evaporated	100	243	195	.2	400	.05	.36	.2	1
Condensed	100	273	228	.2	(430)	.05	.39	.2	1
Dried:									
Whole	100	949	728	.6	1,400	.30	1.46	.7	6
	8	76	58	Tr.	110	.02	.12	.1	1
Nonfat solids	100	1,300	1,030	.6	(40)	.35	1.96	1.1	7
	$7\frac{1}{2}$	98	77	Tr.	Tr.	.03	.15	.1	1
Malted:									
Dry powder	30	81	107	.6	290	.09	.15	—	0
Beverage	270	364	332	.8	680	.18	.56	—	3
Chocolate flavored	100	109	91	.1	90	.03	.16	.1	1
	250	272	228	.2	230	.08	.40	.2	2
Milk, goat	100	129	106	.1	(160)	.04	.11	.3	1
	244	315	259	.2	(390)	.10	.26	.7	2
Molasses, cane:									
Light	100	165	45	4.3	—	.07	.06	.2	—
Medium	100	290	69	6.0	—	—	.12	1.2	—
Blackstrap	100	579	85	11.3	—	.12	.18	1.6	—
Muffins, with enriched flour	100	206	191	1.6	100	.18	.21	1.5	0
Mung bean sprouts	100	29	59	.8	10	.07	.09	.5	15
Mushrooms, canned	100	(7)	(90)	(.8)	0	.02	.25	2.0	—
Mustard greens, cooked	100	220	38	2.9	7,180	.06	.18	.7	45

Tr. See footnote on page 628.
Note: Parentheses indicate imputed value.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Noodles (containing egg), enriched, cooked*	100	⅔ c.	67	2	1	13	.1	84
Oat cereal, ready-to-eat (added vitamins and minerals)	100	4 c.	396	15	7	70	2.0	4
	25	1 c.	100	4	2	18	.4	1
Oatmeal or rolled oats:								
Cooked*	100	⅔ c.	63	2	1	11	.2	85
Precooked (infant food), dry	30	1 oz.	106	4	1	20	.5	2
Oils, salad or cooking	100	½ c.	884	0	100	0	0	0
	14	1 tbsp.	124	0	14	0	0	0
Okra, cooked	100	9 pods	32	2	Tr.	7	1.0	90
Olives, pickled:								
Green	65	10 olives	72	1	7	2	.8	50
Ripe, Mission	65	10 olives	106	1	12	1	1.0	48
Onions:								
Mature:								
Raw	100	1 onion, 2½-in. diam.	45	1	Tr.	10	.8	88
Cooked	100	½ c.	38	1	Tr.	9	.8	90
Young, green	100	12 small, without tops	45	1	Tr.	11	1.8	88
Oranges	100	1 small	45	1	Tr.	11	.6	87
Orange juice:								
Fresh	100	½ c. scant	44	1	Tr.	11	.1	88
Canned, unsweetened	100	½ c. scant	44	1	Tr.	11	.1	88
Orange juice concentrate:								
Canned	100	3½ ozs.	229	4	1	58	.2	35
Frozen	100	3½ ozs.	149	3	1	37	.2	58
Oysters, meat only, raw	100	5-8 medium	84	10	2	7	—	81

*Values are calculated from a recipe.
Tr. See footnote on page 628.

Table 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals: Ca. mg.	Minerals: P. mg.	Minerals: Fe. mg.	Vitamins: Vitamin A I.U.	Vitamins: Thiamine mg.	Vitamins: Riboflavin mg.	Vitamins: Niacin mg.	Vitamins: Ascorbic Acid mg.
Noodles, enriched, cooked	100	4	35	.5	30	.14	.06	1.0	0
Oat cereal, ready-to-eat	100	160	350	4.1	0	.82	.19	1.9	0
	25	40	88	1.0	0	.20	.05	.5	0
Oatmeal:									
Cooked	100	9	67	.7	0	.10	.02	.2	0
Precooked (infant food)	30	225	226	8.9	0	.36	.10	.7	0
Oils	100	0	0	0	0	0	0	0	0
	14	0	0	0	0	0	0	0	0
Okra, cooked	100	82	62	.7	740	.06	.06	.8	20
Olives, pickled:									
Green	65	48	9	.9	160	Tr.	—	—	—
Ripe, Mission	65	48	9	.9	40	Tr.	Tr.	—	—
Onions:									
Mature:									
Raw	100	32	44	.5	50	.03	.04	.2	9
Cooked	100	32	44	.5	50	.02	.03	.2	6
Young	100	135	24	.9	(50)	(.03)	(.04)	(.2)	24
Oranges	100	33	23	.4	(190)	.08	.03	.2	49
Orange juice:									
Fresh	100	19	16	.2	(190)	.08	.03	.2	49
Canned, unsweetened	100	10	18	.3	(100)	.07	.02	.2	42
Orange juice, concentrate:									
Canned	100	61	89	1.6	(510)	.37	.08	1.1	221
Frozen	100	34	60	1.0	(330)	.24	.05	.7	141
Oysters	100	94	143	5.6	320	.15	.20	1.2	—

Tr. See footnote on page 628.

Note: Parentheses indicate imputed value.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Oyster stew:* 1 part oysters to 3 parts milk by volume	100	½ c. scant	91	5	5	5	—	83
Pancakes (griddle-cakes):*								
Wheat (home recipe), with enriched flour	100	4 cakes, 4 in. diam.	218	7	9	27	.1	55
Buckwheat, with buckwheat pancake mix	100	4 cakes	176	6	8	21	.5	62
Papayas, raw	100	½ c., ½ in. cubes	39	1	Tr.	10	.9	89
Parsley, common, raw	3½	1 tbsp. chopped	1	Tr.	0	Tr.	Tr.	2
Parsnips, cooked	100	⅔ c.	60	1	1	14	2.1	84
Peaches:								
Raw	100	1 peach, 2½x2 in. diam.	46	1	Tr.	12	.6	87
Canned, solids and liquid:								
Water pack	100	½ c. scant	27	1	Tr.	7	.3	92
Sirup pack	100	½ c. scant	68	Tr.	Tr.	18	.4	81
Strained (infant food)	30	1 oz.	17	Tr.	Tr.	4	.1	25
Frozen	100	3½ ozs.	78	Tr.	Tr.	20	.4	79
Dried, sulfured:								
Uncooked	100	⅔ c.	265	3	1	69	3.5	24
Cooked, sugar added*	100	4-5 halves, 2 tbsp. fluid	120	1	Tr.	31	1.0	67
Peanuts, Virginia type, roasted, shelled	100	⅔ c.	559	27	44	24	2.4	3
	9	1 tbsp. chopped	50	2	4	2	.2	Tr.
Peanut butter	100		576	26	48	21	2.0	2
	16	1 tbsp.	92	4	8	3	.3	Tr.

*Values are calculated from a recipe.
Tr. See footnote on page 628.

List	Wt.	Minerals: Ca. mg.	Minerals: P. mg.	Minerals: Fe. mg.	Vitamins: Vitamin A I.U.	Vitamins: Thiamine mg.	Vitamins: Riboflavin mg.	Vitamins: Niacin mg.	Vitamins: Ascorbic Acid mg.
Oyster stew	100	117	110	1.5	280	.06	.18	.4	—
Pancakes:									
Wheat with enriched flour	100	158	154	1.3	200	.18	.21	1.3	Tr.
Buckwheat	100	249	362	1.2	110	.16	.16	.9	Tr.
Papayas, raw	100	20	16	.3	1,750	.03	.04	.3	56
Parsley	3½	7†	3	.2	290	Tr.	.01	.1	7
Parsnips, cooked	100	57	80	.7	0	.06	.10	.2	12
Peaches:									
Raw	100	8	22	.6	880	.02	.05	.9	8
Canned:									
Water pack	100	5	14	.4	450	.01	.02	.7	4
Sirup pack	100	5	14	.4	450	.01	.02	.7	4
Strained	30	2	5	.3	180	.01	.01	.2	1
Frozen	100	6	15	.4	520	.01	.03	.5	4
Dried, sulfured:									
Uncooked	100	44	126	6.9	3,250	.01	.20	5.4	19
Cooked, sugar added	100	12	35	1.9	900	Tr.	.05	1.4	4
Peanuts	100 9	74 7	393 35	1.9 .2	0 0	.30 .03	.13 .01	16.2 1.5	0 [illegible]
Peanut butter	100 16	74 12	393 63	1.9 .3	0 0	.12 .02	.13 .02	16.2 2.6	0 0

Tr. See footnote on page 628.
†Calcium may not be available because of the presence of oxalic acid.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Pears:								
Raw	100	1 med. pear 2½x2 in.	63	1	Tr.	16	1.4	83
Canned, solids and liquid:								
Water pack	100	½ c. scant	31	Tr.	Tr.	8	.7	91
Sirup pack	100	2 med. halves	68	Tr.	Tr.	18	.8	81
Strained (infant food)	30	1 oz.	15	Tr.	Tr.	4	.3	26
Peas, green:								
Immature:								
Cooked fresh or frozen	100	⅔ c. drained	70	5	Tr.	12	2.2	82
Canned:								
Solids and liquid	100	½ c. scant	68	4	Tr.	13	1.4	82
Drained solids	100	⅔ c.	91	5	1	17	2.3	77
Strained (infant food)	30	1 oz.	14	1	Tr.	2	.3	26
Mature dry seeds, split	100	½ c.	344	25	1	62	1.2	10
Pecans	100	1 c. halves	696	9	73	13	2.2	3
	7½	1 tbsp. chopped	52	1	6	1	.2	Tr.
Peppers, green:								
Raw	100	1 large	25	1	Tr.	6	1.4	92
Cooked, parboiled, then baked	100	1 large or 2 small	26	1	Tr.	6	1.6	92
Persimmons, Japanese, raw	100	1 medium	78	1	Tr.	20	1.9	78
Pickles:								
Dill, cucumber	100	1 large	11	1	Tr.	2	.4	93
Fresh, cucumber (as bread and butter pickles)	100	½ c.	70	1	Tr.	17	—	80
Sour, cucumber or mixed	100	½ c.	11	1	Tr.	2	.4	95
Sweet, cucumber or mixed	100	½ c.	108	1	Tr.	26	—	71

Tr. See footnote on page 628.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca. mg.	P. mg.	Fe. mg.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Pears: Raw	100	13	16	.3	20	.02	.04	.1	4
Canned: Water pack	100	8	10	.2	Tr.	.01	.02	.1	2
Sirup pack	100	8	10	.2	Tr.	.01	.02	.1	2
Strained	30	3	4	(.1)	10	Tr.	.01	.1	Tr.
Peas: Immature: Cooked	100	22	122	1.9	720	.25	.14	2.3	15
Canned: Solids and liquid	100	25	67	1.8	540	.11	.06	1.0	8
Drained solids	100	32	77	2.1	670	.12	.06	1.0	9
Strained	30	5	18	.4	180	.03	.02	.3	2
Mature, split	100	33	268	5.1	370	.77	.28	3.1	2
Pecans	100	74	324	2.4	50	.72	.11	.9	2
	7½	6	24	.2	Tr.	.05	.01	.1	Tr.
Peppers, green: Raw	100	11	25	.4	630	.04	.07	.4	120
Cooked	100	11	25	.4	740	.04	.07	.4	99
Persimmons, raw	100	6	26	.3	2,710	.05	.05	Tr.	11
Pickles: Dill	100	25	20	1.2	310	Tr.	.06	Tr.	6
Fresh, as bread and butter pickles	100	32	27	1.8	180	.02	.04	Tr.	9
Sour	100	25	20	1.2	310	Tr.	.06	Tr.	6
Sweet	100	16	18	1.3	110	0	.02	Tr.	7

Tr. See footnote on page 628.

Note: Parentheses indicate imputed value.

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Pies:		1/7 of 9-in. pie						
Apple*	135		331	3	13	53	1.0	64
Blueberry*	135		291	3	9	51	1.0	71
Cherry*	135		340	3	13	55	.2	61
Custard or cocoanut custard	130		266	7	11	34	0	79
Lemon meringue	120		302	4	12	45	0	63
Mince*	135		341	3	9	62	.5	57
Pumpkin	130		263	6	13	34	.6	79
Pimientos, canned	38	1 medium	10	Tr.	Tr.	2	.2	34
Pineapple:								
Raw	100	¾ c. diced	52	Tr.	Tr.	14	.4	85
Canned, sirup pack, solids and liquid	100	1 med. slice, 2 tbsp. juice	78	Tr.	Tr.	21	.3	78
Frozen	100	3½ ozs.	86	Tr.	Tr.	22	.4	77
Pineapple juice, canned	100	½ c. scant	49	Tr.	Tr.	13	.1	86
Plums:								
All excluding prunes, raw	100	2 medium	50	1	Tr.	13	.5	86
Italian prunes, canned, sirup pack, solids and liquid	100	½ c. scant or 3 med. prunes	76	Tr.	Tr.	20	.3	79
Popcorn, popped	14	1 c.	54	2	1	10	.3	1
Pork, fresh:								
Retail items, medium fat:								
Ham, cooked	100	3½ ozs.	400	24	33	0	0	42
Loin or chops, cooked	100	3½ ozs.	333	23	26	0	0	50
Miscellaneous lean cuts, raw	100	3½ ozs.	357	15	33	0	0	52

*Values are calculated from a recipe.
Tr. See footnote on page 628.

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals: Ca. mg.	Minerals: P. mg.	Minerals: Fe. mg.	Vitamins: Vitamin A I.U.	Vitamins: Thiamine mg.	Vitamins: Riboflavin mg.	Vitamins: Niacin mg.	Vitamins: Ascorbic Acid mg.
Pies:									
Apple	135	9	32	.5	220	.04	.02	.3	1
Blueberry	135	14	30	.7	160	.02	.04	.3	5
Cherry	135	14	36	.5	520	.04	.02	.3	2
Custard or cocoanut custard	130	162	151	1.6	290	.07	.21	.4	0
Lemon meringue	120	24	61	.6	210	.04	.10	.2	1
Mince	135	22	54	3.0	10	.09	.05	.5	1
Pumpkin	130	70	105	1.0	2,480	.04	.15	.4	0
Pimientos, canned	38	3	6	.6	870	.01	.02	.1	36
Pineapple:									
Raw	100	16	11	.3	130	.08	.02	.2	24
Canned, sirup pack	100	29	7	.6	80	.07	.02	.2	9
Frozen	100	14	10	.3	100	.06	.02	.2	19
Pineapple juice	100	15	8	.5	80	.05	.02	.2	9
Plums:									
Raw	100	17	20	.5	350	.06	.04	.5	5
Italian prunes, canned, sirup pack, solids and liquids	100	8	12	1.1	230	.03	.03	.4	1
Popcorn, popped	14	(2)	(39)	(.4)	0	(.05)	(.02)	(.3)	0
Pork, fresh, retail items:									
Ham, cooked	100	11	238	3.1	0	.53	.24	4.7	0
Loin or chops, cooked	100	11	235	3.0	0	.83	.24	5.0	0
Miscellaneous lean cuts, raw	100	8	157	2.2	0	.70	.17	3.8	0

Note: Parentheses indicate imputed value.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Pork:								
Cured:								
Ham, smoked, medium fat, cooked	100	3½ ozs.	397	23	33	Tr.	0	39
Luncheon meat:								
Boiled ham	100	3½ ozs.	302	23	23	0	0	48
Canned, spiced	100	3½ ozs.	289	15	24	2	.2	55
Salt pork, fat, raw	100	3½ ozs.	783	4	85	0	0	8
Canned, strained (infant food)	30	1 oz.	36	5	2	0	0	23
Potatoes:								
Cooked:								
Baked	100	1 medium	98	2	Tr.	23	.5	74
Boiled or steamed, peeled before cooking	100	1 medium	83	2	Tr.	19	.4	78
French fried*	100	20 pieces, 2x½x½	393	5	19	52	1.1	20
Fried, raw	100	⅔ c.	282	4	14	36	.8	43
Hash-browned after holding overnight	100	½ c.	241	3	12	32	.7	51
Mashed, milk and butter added*	100	½ c.	123	2	6	16	.3	74
Dehydrated	100	3½ ozs.	357	7	1	82	2.2	7
Potato chips	20	10 med. or 7 large	108	1	7	10	.1	1
Potato flour	100	1 c. sifted	357	7	1	82	2.2	7
Pretzels	5	5 small sticks	18	Tr.	Tr.	4	Tr.	Tr.
Prunes:								
Dried, unsulfured:								
Uncooked	100	⅔ c. medium	268	2	1	71	1.6	24
Cooked, no sugar added	100	6 prunes, 2 tbsp. juice	125	1	Tr.	33	.8	65
Cooked, sugar added	100	6 prunes, 2 tbsp. juice	165	1	Tr.	43	.6	55
Canned, strained, (infant food)	30		28	Tr.	Tr.	7	.2	22

*Values are calculated from a recipe.

Tr. See footnote on page 628.

Table 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals: Ca. mg.	Minerals: P. mg.	Minerals: Fe. mg.	Vitamins: Vitamin A I.U.	Vitamins: Thiamine mg.	Vitamins: Riboflavin mg.	Vitamins: Niacin mg.	Vitamins: Ascorbic Acid mg.
Pork:									
Cured:									
Ham, smoked, cooked	100	10	166	2.9	0	.54	.21	4.2	0
Luncheon meat:									
Boiled ham	100	9	92	2.7	0	1.01	.26	5.1	0
Canned, spiced	100	9	161	2.2	0	.32	.22	2.8	0
Salt pork	100	Tr.	Tr.	.6	0	(.18)	(.04)	(.9)	0
Canned, (infant food)	100	4	51	.5	0	.10	.08	1.3	0
Potatoes:									
Cooked:									
Baked	100	13	66	.8	20	.11	.05	1.4	17†
Boiled or steamed	100	11	56	.7	20	.09	.03	1.0	14
French fried	100	30	152	1.9	50	.18	.11	3.3	28
Fried, raw	100	21	106	1.3	40	.12	.08	2.3	19
Hash-browned	100	18	93	1.2	30	.08	.06	1.7	7
Mashed with milk, butter	100	27	59	.6	260	.08	.05	.8	7
Dehydrated	100	25	88	4.0	40	.30	.11	4.5	23
Potato chips	20	(6)	(30)	(.4)	(10)	(.04)	.02	.6	2
Potato flour	100	25	88	4.0	40	.30	.11	4.5	23
Pretzels	5	1	4	Tr.	0	Tr.	Tr.	Tr.	0
Prunes:									
Dried:									
Uncooked	100	54	85	3.9	1,890	.10	.16	1.7	3
Cooked, no sugar added	100	25	40	1.8	890	.03	.08	.8	1
Cooked, sugar added	100	22	34	1.5	750	.03	.06	.6	1
Canned (infant food)	30	7	8	.4	210	.01	.01	.2	1

Tr. See footnote on page 628.

Note: Parentheses indicate imputed value.

†Year-round average. Recently dug potatoes contain about 24 mg. of ascorbic acid per 100 Gm. The value is only half as high after 3 months of storage and about one third as high when potatoes have been stored as long as 6 months.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Prune juice, canned	100	½ c. scant	71	Tr.	0	19	—	80
Prune whip*	100	¾ c.	148	3	Tr.	37	.7	59
Pumpkin, canned	100	⅞ c.	33	1	Tr.	8	1.2	90
Radishes, raw	40	4 small	4	Tr.	Tr.	1	.1	37
Raisins, unsulfured, dried, seedless	100	⅔ c.	268	2	1	71	—	24
	10	1 tbsp.	26	Tr.	Tr.	7	—	2
Raspberries:								
Black, raw	100	¾ c.	74	2	2	16	6.8	81
Red:								
Raw	100	¾ c.	57	1	Tr.	14	4.7	84
Frozen	100	3½ ozs.	98	1	Tr.	25	3.3	74
Rhubarb, stems only:								
Raw	100	¾ c. diced	16	1	Tr.	4	.7	95
Cooked, sugar added or canned in sirup*	100	⅓ c.	141	Tr.	Tr.	36	.6	63
Rice:								
Brown, raw	100	½ c.	360	8	2	78	.6	12
Converted:								
Raw	100	½ c.	362	8	Tr.	79	.2	12
Cooked, fluffy*	100	⅔ c.	116	2	Tr.	25	.1	72
White or milled:								
Raw	100	½ c.	362	8	Tr.	79	.2	12
Cooked*	100	⅔ c.	119	3	Tr.	26	.1	71
Rice products:								
Flakes (added thiamine and niacin)	30	1 c.	118	2	Tr.	26	.2	1
Puffed (added thiamine and niacin)	14	1 c.	55	1	Tr.	12	.1	Tr.
Rice, wild. See Wild rice.								

*Values are calculated from a recipe.
Tr. See footnote on page 628.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca. mg.	P. mg.	Fe. mg.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Prune juice, canned	100	(25)	(40)	(1.8)	—	(.03)	(.08)	.4	(1)
Prune whip	100	26	42	1.8	860	.04	.11	.7	2
Pumpkin, canned	100	(20)	(36)	(.7)	3,400	.02	.06	.5	—
Radishes, raw	20	7	6	.2	10	.01	Tr.	.1	5
Raisins, unsulfured, dried	100	78	129	3.3	50	.15	.08	.5	Tr.
	10	8	13	.3	5	.02	.01	Tr.	Tr.
Raspberries:									
Black, raw	100	40	37	.9	0	.02	(.07)	(.3)	(24)
Red:									
Raw	100	40	37	.9	130	.02	(.07)	(.3)	24
Frozen	100	28	26	.6	80	.01	(.04)	(.2)	16
Rhubarb, stems only:									
Raw	100	51†	25	.5	30	.01	—	.1	9
Cooked, sugar added	100	41†	20	.4	20	.01	—	.1	6
Rice:									
Brown, raw	100	39	303	2.0	0	.32	.05	4.6	0
Converted:									
Raw	100	24	136	.8	0	.20	.03	3.8	0
Cooked, fluffy	100	8	43	.3	0	.05	.01	1.1	0
White or milled:									
Raw	100	24	136	.8	0	.07	.03	1.6	0
Cooked	100	8	45	.3	0	.01	.01	.4	0
Rice products:									
Flakes (added thiamine, niacin)	30	6	35	.5	0	.14	.03	1.6	0
Puffed (added thiamine, niacin)	14	3	16	.3	0	.06	.01	.8	0

Tr. See footnote on page 628.
Note: Parentheses indicate imputed value.
†Calcium may not be available because of the presence of oxalic acid.

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Pro-tein Gm.	Fat Gm.	Carbo-hydrate Total Gm.	Carbo-hydrate Fiber Gm.	Water Gm.
Rolls:*								
Plain, enriched (pan rolls)	28	1 small	86	3	2	15	Tr.	7
	57	1 large	176	5	3	31	Tr.	15
Sweet, enriched	100	2 rolls	323	9	8	54	.2	28
	55	1 roll	178	5	4	30	.1	15
Rutabagas, cooked	100	⅔ c. diced	32	1	Tr.	8	1.4	91
Rye flour:								
Light	100	1¼ c. sifted	358	9	1	78	.4	11
Medium	100	1¼ c. sifted	350	11	2	75	1.0	11
Dark	100	1½ c. sifted	330	16	3	68	2.4	11
Rye wafers or "Swedish health bread"	13	1⅞x3½ in. 2 wafers	43	2	Tr.	10	.3	1
Salad dressings:								
Commercial, plain (mayonnaise type)	100	½ c. scant	384	1	87	14	0	45
	15	1 tbsp.	58	Tr.	6	2	0	7
French	100	2/5 c.	394	1	36	20	.3	40
	15	1 tbsp.	59	Tr.	5	3	Tr.	6
Home-cooked, boiled*	100	½ c. scant	165	5	10	15	0	68
	17	1 tbsp.	28	1	2	3	0	11
Mayonnaise	100	½ c.	708	2	78	3	0	16
	13	1 tbsp.	92	Tr.	10	Tr.	0	2
Salmon. See Fish								
Sardines. See Fish								
Sauerkraut, canned, drained solids	100	⅔ c.	22	1	Tr.	4	.9	91
Sausage:								
Bologna	100	3½ ozs.	221	15	16	4	—	62
Frankfurter, cooked	100	2 medium	248	14	20	2	—	62
Liver, liverwurst	100	3½ ozs.	263	17	21	2	—	59
Pork, links or bulk, raw	100	3½ ozs.	450	11	45	0	0	42
Pork, bulk, canned	100	3½ ozs.	299	15	26	0	0	55
Vienna sausage, canned	100	3½ ozs.	215	16	16	0	0	64

*Values are calculated from a recipe.
Tr. See footnote on page 628.

Table 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals: Ca. mg.	Minerals: P. mg.	Minerals: Fe. mg.	Vitamins: Vitamin A I.U.	Vitamins: Thiamine mg.	Vitamins: Riboflavin mg.	Vitamins: Niacin mg.	Vitamins: Ascorbic Acid mg.
Rolls, plain, enriched	28	15	27	.5†	0	.07†	.04†	.6†	0
	57	31	55	1.0†	0	.14†	.09†	1.3†	0
Sweet, enriched	100	63	104	1.8†	0	.24†	.15†	2.2†	0
	55	35	57	1.0†	0	.13†	.08†	1.2†	0
Rutabagas, cooked	100	55	41	.4	350	.05	.07	.7	21
Rye flour:									
Light	100	22	185	1.1	0	.15	.07	.6	0
Medium	100	(27)	262	2.6	0	.30	.12	2.5	0
Dark	100	54	(536)	4.5	0	.61	.22	2.7	0
Rye wafers or "Swedish health bread"	13	6	52	.6	0	.04	.03	.2	0
Salad dressings:									
Commercial, plain	100	9	30	.4	140	.02	.03	0	0
	15	1	4	.1	20	Tr.	Tr.	0	0
French	100	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0
Home-cooked	100	90	102	.7	500	.06	.17	.3	Tr.
	17	15	17	.1	80	.01	.03	Tr.	Tr.
Mayonnaise	100	19	60	1.0	210	.04	.04	0	0
	13	2	8	.1	30	Tr.	Tr.	0	0
Salmon. See Fish									
Sardines. See Fish									
Sauerkraut, canned, drained solids	100	36	18	(.5)	40	.03	.06	.1	16
Sausage:									
Bologna	100	(9)	(112)	2.2	0	.18	.19	2.7	0
Frankfurters, cooked	100	6	49	1.2	0	.16	.18	2.5	0
Liver, liverwurst	100	9	238	5.4	5,750	.17	1.12	4.5	0
Pork, raw	100	6	100	1.6	0	.43	.17	2.3	0
Pork, bulk, canned	100	9	166	2.3	0	.20	.24	3.0	0
Vienna sausage	100	9	170	2.4	0	.10	.12	3.1	0

Tr. See footnote on page 628.
Note: Parentheses indicate imputed value.
†Iron, thiamine, riboflavin and niacin are based on the minimum level of enrichment specified by the Federal Security Agency.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate		Water Gm.
						Total Gm.	Fiber Gm.	
Scallops, raw	100	3½ ozs.	78	15	Tr.	3	0	80
Sherbet*	100	½ c.	123	2	0	30	—	68
Shortbread*	100	12 pieces	504	7	24	64	.2	4
	16	2 squares, 1¾x1¾ in.	81	1	4	10	Tr.	1
Shrimp, canned, dry pack or drained solids of wet pack	100	3½ ozs.	127	27	1	—	—	66
Sirup, table blends (chiefly corn sirup)	100	⅓ c.	286	0	0	74	—	25
	20	1 tbsp.	57	0	0	(15)	—	5
Soups, canned:†								
Bean, ready to serve	250	1 c.	191	9	5	30	1.5	205
Beef, ready to serve	250	1 c.	100	6	4	11	.2	229
Bouillon, ready to serve	240	1 c.	9	(2)	—	0	0	228
Chicken, ready to serve	250	1 c.	75	4	3	10	.2	235
Clam chowder, ready to serve	255	1 c.	86	5	2	13	.5	227
Cream soup (asparagus, celery or mushroom)	255	1 c.	201	7	12	18	.2	212
Liver soup, strained (infant food)	30	1 oz.	16	1	Tr.	2	.1	26
Noodle, rice or barley, ready to serve	250	1 c.	117	6	5	13	1.3	226
Pea, ready to serve	245	1 c.	141	6	2	25	1.5	215
Tomato, ready to serve	245	1 c.	90	2	2	18	.5	225
Vegetable:								
Ready to serve	250	1 c.	82	4	2	15	.8	229
Strained (infant food)	30	1 oz.	12	1	Tr.	3	.2	26
Vegetable and lamb soup, strained (infant food)	30	1 oz.	14	1	Tr.	2	.2	27

*Values are calculated from a recipe.
Tr. See footnote on page 628.
Note: Parentheses indicate imputed value.
†All ready-to-serve soups are calculated from equal weights of the condensed soup and water, except cream soup, which is based on equal weights of the condensed soups and milk.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca. mg.	P. mg.	Fe. mg.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Scallops, raw	100	26	208	1.8	0	(.04)	.10	1.4	—
Sherbet*	100	50	40	0	0	.02	.08	Tr.	—
Shortbread*	100	10	59	.4	0	.04	.02	.5	0
	16	2	9	.1	0	.01	Tr.	.1	0
Shrimp, canned, dry pack or drained solids	100	115	263	3.1	60	.01	.03	2.2	0
Sirup, table blends	100	46	16	4.1	0	0	.01	.1	0
	20	9	3	.8	0	0	Tr.	Tr.	0
Soups, canned:†									
Bean, ready to serve	250	95	102	2.8	—	.10	.10	.8	—
Beef, ready to serve	250	15	62	.5	—	—	—	—	—
Bouillon, ready to serve	240	2	24	1.0	0	0	.05	.6	0
Chicken, ready to serve	250	20	20	.5	—	.02	.12	1.5	—
Clam chowder, ready to serve	255	36	76	3.6	—	—	—	—	—
Cream soup	255	217	176	.5	200	.05	.20	.1	0
Liver soup, strained	30	5	18	.5	1,340	.02	.12	.5	1
Noodle, rice or barley	250	82	85	.2	30	.02	.05	.7	0
Pea, ready to serve	245	32	98	1.5	(440)	.17	.07	1.2	5
Tomato, ready to serve	245	24	39	1.0	(1,230)	.02	.10	.7	10
Vegetable:									
Ready to serve	250	32	50	.8	—	.05	.08	1.0	8
Strained	30	7	11	.3	700	.02	.02	.1	Tr.
Vegetable and lamb soup, strained	30	6	10	.2	740	.01	.01	.3	Tr.

*Values are calculated from a recipe.
Tr. See footnote on page 628.
Note: Parentheses indicate imputed value.
†All ready-to-serve soups are calculated from equal weights of the condensed soup and water, except cream soup, which is based on equal weights of the condensed soups and milk.

Table 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Soybeans, whole, mature, dried	100	3½ ozs.	331	35	18	35†	5.0	8
Soybean flour, flakes, grits:								
Low fat	100	1 c.	238	45	1	38†	2.3	11
Medium fat	100	1 c.	264	43	7	37†	2.6	9
Soybean sprouts, raw	100	1 c.	46	6	1	5	.8	86
Spaghetti:								
Unenriched:								
Dry	100	1 c., 2-in. pieces	377	13	1	77	.4	9
Cooked*	100	⅔ c.	149	5	1	30	.2	61
Enriched:								
Dry	100	1 c., 2-in. pieces	377	13	1	77	.4	9
Cooked*	100	⅔ c.	149	5	1	30	.2	61
Spinach:								
Raw	100	3½ ozs.	20	2	Tr.	3	.6	93
Cooked	100	½ c. packed	26	3	1	4	1.0	91
Canned:								
Drained solids	100	½ c. packed	26	3	1	4	1.0	91
Strained (infant food)	30	1 oz.	4	1	Tr.	1	.2	28
Frozen	100	3½ ozs.	20	2	Tr.	3	.6	93
Squash:								
Summer:								
Cooked, diced, fresh or frozen	100	½ c.	16	1	Tr.	4	.5	95
Winter:								
Baked, mashed	100	½ c.	47	2	Tr.	11	1.8	86
Boiled, mashed	100	½ c.	38	2	Tr.	9	1.4	89
Canned, strained (infant food)	30	1 oz.	8	Tr.	Tr.	2	.2	27
Starch, pure (including arrowroot, corn, etc.)	100	¾ c.	362	1	Tr.	87	.1	12
	8	1 tbsp.	29	0	0	7	Tr.	1

*Values are calculated from a recipe.
Tr. See footnote on page 628.
†Approximately 40 per cent of this total amount of carbohydrate calculated by difference is sugar, starch and dextrin. The remaining portion is made up of materials thought to be utilized only poorly, if at all, by the body.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca. mg.	P. mg.	Fe. mg.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Soybeans, whole, mature, dried	100	227	586	8.0	110	1.07	.31	2.3	Tr.
Soybean flour, flakes, grits:									
Low fat	100	265	623	13.0	70	1.10	.35	2.9	0
Medium fat	100	244	610	13.0	110	.82	.34	2.6	0
Soybean sprouts	100	48	67	1.0	180	.23	.20	.8	13
Spaghetti:									
Unenriched:									
Dry	100	22	165	1.5	0	.09	.06	2.0	0
Cooked	100	9	65	.6	0	.02	.02	.5	0
Enriched:									
Dry	100	22	165	2.9†	0	.88†	.37†	6.0†	0
Cooked	100	9	65	1.1	0	.17	.10	1.4	0
Spinach:									
Raw	100	81‡	55	3.0	9,420	.11	.20	.6	59
Cooked	100	124‡	33	2.0	11,780	.08	.20	.6	30
Canned:									
Drained solids	100	124‡	33	2.0	7,630	.02	.12	.4	14
Strained (infant food)	30	22‡	11	.4	1,190	.01	.03	.1	2
Frozen	100	81‡	55	3.0	6,820	.07	.17	.5	38
Squash:									
Summer:									
Cooked, diced, fresh, frozen	100	15	15	.4	260	.04	.07	.6	11
Winter:									
Baked	100	24	35	.8	6,190	.05	.15	.6	7
Boiled	100	19	28	.6	4,950	.04	.10	.4	5
Canned, strained (infant food)	30	9	5	.1	560	.01	.02	(.1)	1
Starch, pure (including arrowroot, corn, etc.)	100	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	0	0	0

Tr. See footnote on page 628.
Note: Parentheses indicate imputed value.
†Iron, thiamine, riboflavin and niacin are based on the minimum level of enrichment specified under the Food, Drug and Cosmetic Act.
‡Calcium may not be available because of presence of oxalic acid

Table 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Pro-tein Gm.	Fat Gm.	Carbo-hydrate Total Gm.	Carbo-hydrate Fiber Gm.	Water Gm.
Strawberries:								
Raw, capped	100	⅔ c.	37	1	1	8	1.4	90
Frozen, sugar added	100	3½ ozs.	106	1	Tr.	27	1.1	72
Sugars:								
Granulated, cane or beet	100	½ c.	385	0	0	100	0	1
	12	1 tbsp.	48	0	0	12	0	—
Powdered	100	¾ c.	385	0	0	100	0	1
Brown, dark	100	½ c.	370	0	0	96	0	3
Maple	100	3½ ozs.	348	—	—	(90)	0	8
Sweet potatoes:								
Baked	100	1 small	152	2	1	34	1.2	61
Boiled	100	½ medium	123	2	1	28	1.0	69
Candied	100	½ medium	179	2	4	36	.8	57
Canned, vacuum or solid pack	100	½ c.	107	2	Tr.	25	1.0	72
Tangerines (including other Mandarin type oranges)	100	1 medium	44	1	Tr.	11	1.0	87
Tangerine juice, unsweetened:								
Fresh or frozen reconstituted	100	½ c. scant	39	1	Tr.	9	—	89
Canned	100	½ c. scant	39	1	Tr.	9	—	89
Tapioca, dry, granulated	100	⅔ c.	360	1	Tr.	86	.1	13
Tomatoes:								
Raw	100	1 sma	20	1	Tr.	4	.6	94
Canned or cooked	100	½ c.	19	1	Tr.	4	.4	94
Tomato juice, canned	100	½ c. scant	21	1	Tr.	4	.2	94
Tomato catsup	17	1 tbsp.	17	Tr.	Tr.	4	.1	12
Tomato puree, canned	100	½ c. scant	36	2	1	7	.4	89
Tongue beef, medium fat, raw	100	3½ ozs.	207	16	15	Tr.	0	68
Tortillas	100	5 tortillas	211	6	(3)	49	(1.4)	42
	20	1 tortilla	50	1	(1)	10	(.3)	8

Tr. See footnote on page 628.
Note: Parentheses indicate imputed value.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca. mg.	P. mg.	Fe. mg.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Strawberries:									
Raw, capped	100	28	27	.8	60	.03	.07	.3	60
Frozen	100	22	22	.6	40	.02	.05	.2	41
Sugars:									
Granulated	100	—	—	—	0	0	0	0	0
	12	—	—	—	0	0	0	0	0
Powdered	100	—	—	—	0	0	0	0	0
Brown, dark	100	76	37	2.6	0	0	0	0	0
Maple	100	—	—	—	—	—	—	—	—
Sweet potatoes:									
Baked	100	37	60	.9	9,510	.10	.06	.8	23
Boiled	100	30	49	.7	7,700	.09	.05	.6	20
Candied	100	36	45	.9	6,250	.04	.04	.5	9
Canned, vacuum or solid pack	100	25	41	.8	8,850	.05	.04	.5	14
Tangerines (other Mandarin type oranges)	100	(33)	(23)	(.4)	(420)	.07	(.03)	(.2)	31
Tangerine juice:									
Fresh or frozen reconstituted	100	19	16	(.2)	(420)	.07	(.03)	.2	31
Canned	100	19	16	.2	(420)	(.06)	(.03)	(.2)	(26)
Tapioca, dry	100	12	12	(1.0)	0	0	0	0	0
Tomatoes:									
Raw	100	11	27	.6	1,100	.06	.04	.5	23
Canned or cooked	100	(11)	(27)	(.6)	1,050	.06	.03	.7	16
Tomato juice, canned	100	(7)	(15)	(.4)	1,050	.05	.03	.8	16
Tomato catsup	17	2	3	.1	(320)	.02	.01	.4	2
Tomato purée, canned	100	(11)	(37)	(1.1)	1,880	.09	.07	1.8	28
Tongue, beef	100	9	187	2.8	0	.12	.29	5.0	0
Tortillas	100	111	184	2.2	210†	.19	.06	1.0	—
	20	22	37	.4	40†	.04	.01	.2	—

Note: Parentheses indicate imputed value.
†Vitamin A value of tortillas made from yellow corn: tortillas made from white corn have no vitamin A value.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Tuna fish. See Fish								
Turkey, medium fat, raw	100	3½ ozs.	268	20	20	0	0	58
Turnips:								
Raw	100	¾ c. diced	32	1	Tr.	7	1.1	91
Cooked	100	⅔ c. diced	27	1	Tr.	6	1.2	92
Turnip greens, boiled in small amount of water	100	⅔ c.	30	3	Tr.	5	1.2	90
Veal:								
Retail items, medium fat:								
Cutlet, boned, cooked	100	3½ ozs.	219	28	11	0	0	60
Shoulder roast, boned, cooked	100	3½ ozs.	228	28	12	0	0	59
Stew meat without bone, cooked with liquid	100	3½ ozs.	296	25	21	0	0	53
Canned, strained (infant food)	30	1 oz.	24	5	1	0	0	24
Vegetables, mixed, strained, canned (infant food)	30	1 oz.	8	1	0	2	.2	27
Vinegar	100	½ c. scant	12	0	—	(5)	0	—
Waffles, baked, with enriched flour*	75	1 waffle 4½x5½x½	216	7	8	28	.1	30
Walnuts, Persian or English	100	1 c. of halves	654	15	64	16	2.1	3
	8	1 tbsp. chopped	49	1	5	1	.2	Tr.
Watermelons	100	3½ ozs. per portion	28	1	Tr.	7	.6	92

*Values are calculated from a recipe.
Tr. See footnote on page 628.
Note: Parentheses indicate imputed value.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca. mg.	P. mg.	Fe. mg.	Vitamin A I U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Tuna fish. See Fish									
Turkey	100	23	320	3.8	Tr.	.09	.14	8.0	0
Turnips:									
Raw	100	40	34	.5	Tr.	.05	.07	.5	28
Cooked	100	40	34	.5	Tr.	.04	.06	.4	18
Turnip greens, boiled in small amount of water	100	259	50	2.4	10,600	.06	.41	.7	60
Veal:									
Retail items:									
Cutlet, boned, cooked	100	12	258	3.5	0	.08	.28	6.1	0
Shoulder roast, cooked	100	12	258	3.6	0	.13	.31	7.9	0
Stew meat, cooked	100	11	124	3.0	0	.10	.32	9.2	0
Canned (infant food)	30	4	48	.5	0	.01	.09	1.6	0
Vegetables, mixed (infant food)	30	9	10	.3	270 to 1,510	.01	.01	.1	1
Vinegar	100	7	10	.5	—	—	—	—	—
Waffles, baked, enriched flour	75	144	153	.8	270	.05	.14	.3	0
Walnuts	100 8	83 6	380 28	2.1 .2	30 Tr.	.48 .04	.13 .01	1.2 .1	3 Tr.
Watermelons	100	7	12	.2	590	.05	.05	.2	6

Tr. See footnote on page 628.

TABLE 1 (*Continued*)

COMPOSITION OF FOODS EDIBLE PORTION

Food and description	Wt. Gm.	Approximate Measure	Food Energy Cal.	Protein Gm.	Fat Gm.	Carbohydrate Total Gm.	Carbohydrate Fiber Gm.	Water Gm.
Wheat flours:								
Whole (from hard wheat)	100	1 c. scant	333	13	2	71	2.3	12
Self-rising, enriched	100	1 c. scant	350	9	1	74	.4	12
Patent:								
All purpose or family flour:								
Unenriched	100	1 c. scant	364	11	1	76	.3	12
Enriched	100	1 c. scant	364	11	1	76	.3	12
Bread flour:								
Unenriched	100	1 c. scant	365	12	1	75	.3	12
Enriched	100	1 c. scant	365	12	1	75	.3	12
Cake or pastry flour	100	1 c. level	364	8	1	79	.2	12
Wheat products:								
Flakes (added iron, thiamine and niacin)	100	4 c.	355	11	2	80	1.7	4
	35	1 c.	125	4	1	28	.6	1
Germ	100	3½ ozs., 1 c.	361	25	10	50	2.5	11
Puffed (added iron, thiamine and niacin)	100	8 c.	355	11	2	80	1.7	4
	12	1 c.	43	1	Tr.	10	.2	1
Rolled, cooked*	100	½ c. scant	75	2	Tr.	17	.5	80
Shredded, plain	30	1 large biscuit 4x2¼ in.	102	3	1	23	.7	2
Whole meal, cooked*	100	½ c. scant	72	3	Tr.	16	.4	80
Whole meal (added wheat germ, iron and thiamine), cooked*	100	½ c. scant	55	2	Tr.	12	.3	85
White sauce, medium*	100	½ c. scant	162	4	13	9	0	74
Wild rice, parched, raw	100	⅔ c.	353	14	1	75	1.0	9
Yeast:								
Compressed, baker's	12	1 cake, 1 in. square	12	1	Tr.	3	Tr.	9
Dried, brewer's	8	1 tbsp.	22	(3)	Tr.	3	.1	1

*Values are calculated from a recipe.
Tr. See footnote on page 628.
Note: Parentheses indicate imputed value.

TABLE 1 (*Continued*)

MINERALS AND VITAMINS IN FOODS

List	Wt.	Minerals			Vitamins				
		Ca. mg.	P. mg.	Fe. mg.	Vitamin A I.U.	Thiamine mg.	Riboflavin mg.	Niacin mg.	Ascorbic Acid mg.
Wheat, flours:									
Whole	100	41	372	3.3	0	.55	.12	4.3	0
Self-rising, enriched	100	272†	484	2.9‡	0	.44‡	.26‡	3.5‡	0
Patent:									
All purpose or family flour:									
Unenriched	100	16	87	.8	0	.06	.05	.9	0
Enriched	100	16	87	2.9‡	0	.44‡	.26‡	3.5‡	0
Bread flour:									
Unenriched	100	16	95	.9	0	.08	.06	1.0	0
Enriched	100	16	95	2.9‡	0	.44‡	.26‡	3.5‡	0
Cake or pastry	100	17	73	.5	0	.03	.03	.7	0
Wheat products:									
Flakes	100	46	329	4.2	0	.56	.18	6.4	0
	35	16	115	1.5	0	.20	.06	2.2	0
Germ	100	84	1,096	8.1	0	2.05	.80	4.6	0
Puffed	100	46	329	4.2	0	.56	.18	6.4	0
	12	6	39	.5	0	.07	.02	.8	0
Rolled, cooked	100	8	76	.7	0	.07	.03	.9	0
Shredded, plain	30	13	102	1.0	0	.06	.03	1.3	0
Whole meal, cooked	100	9	83	.7	0	.10	.03	.9	0
Whole meal, enriched, cooked	100	8	65	4.9	0	.22	.03	.8	0
White sauce	100	115	95	.1	510	.03	.15	.1	Tr.
Wild rice	100	19	339	—	0	.45	.63	6.2	0
Yeast:									
Compressed, baker's	112	3	86	.7	0	.06	.25	3.4	0
Dried, brewer's	8	8	151	1.5	0	.78	.44	2.9	0

Tr. See footnote on page 628.
†Calcium is based on the level usually found in self-rising flour.
‡Iron, thiamine, riboflavin and niacin are based on the minimum level of enrichment specified under the Food, Drug and Cosmetic Act.

Table 2

FOOD COMPOSITION TABLE FOR SHORT METHOD OF DIETARY ANALYSIS[1]

FOOD*	APPROXIMATE MEASURE	WT. Gm.	CALORIES	PROT. Gm.	FAT Gm.	CARBOHYDRATE Gm.	Ca Gm.	P Gm.	Fe mg.	VIT. A I.U.	ASCORBIC ACID mg.	THIAMINE mg.	RIBOFLAVIN mg.	NIACIN mg.
Cereal products:														
Refined	1 sl. bread (30 Gm.); ½ cup cooked cereal and cereal products (20 Gm. dry); ½-1 c. prep. cereal (20 Gm.); 3 soda crackers (20 Gm.); 1½ c. popcorn (20 Gm.); 1 griddle cake (4-in. diam.).		80	2.5	1	15	.01	.02	.2	—	—	.02	.02	.3
Whole grain and enriched	1 sl. bread (30 Gm.); ½ c. cooked cereal (20 Gm. dry); ½-1 c. prepared cereal (20 Gm.); 2 graham crackers (20 Gm.).		80	2.5	1	15	.02	.03	.6	—	—	.07	.04	.6
Dairy products:														
Butter, Margarine	1 tsp.	5	35	—	4	—	—	—	—	165	—	—	—	—
Cheese, Cheddar type	1 cu. in.	30	125	7.5	10	1	.22	.15	.3	420	—	.01	.13	—
Cheese, cottage, skim	½ c.	100	95	19.5	1	2	.10	.19	.3	20	—	.02	.31	.1
Cream, light	⅛ c. (for heavy cream add ½ serving butter)	30	60	1.0	6	1	.03	.02	—	250	—	.01	.04	—

Custard	½ c.	130	150	7.0	7	15	.15	.16	.6	440	—	.06	.26	.1
Egg	1 medium	50	80	6.5	6	—	.03	.10	1.4	570	—	.05	.14	.1
Ice cream	½ c.	80	165	3.0	10	16	.10	.08	.1	420	1	.03	.15	.1
Milk														
Buttermilk, skim	1 c.	240	85	8.5	—	12	.30	.23	.2	—	2	.10	.43	.2
Whole	1 c.	240	165	8.5	9	12	.28	.22	.2	385	2	.10	.41	.2
Desserts:														
Cake, plain, chocolate	1 piece cake 2½ x 2½ x 2½ (75 Gm.), for iced add 1 serving sweets; 1 waffle, 6-in. diam. (60 Gm.); 2½ doughnuts, cake type (add 1 serving fat)		250	5.0	8	40	.09	.10	.4	140	—	.02	.06	.2
Cookies, plain	2 medium	40	175	2.5	5	30	.01	.03	.4	100	—	.02	.02	.2
Pie crust	⅙ shell, single crust	25	110	1.5	6	12	—	.01	.4	—	—	.05	.04	.5
Puddings, cream fillings	½ c.	140	150	4.5	5	22	.14	.13	.1	225	—	.04	.22	.1
Fats:	2 sl. bacon (20 Gm. raw); 1 tbsp. fat (12 Gm.); 1 tbsp. mayonnaise (15 Gm.); 1 cu. in. salt pork (15 Gm.); 2 tbsp. French dressing (30 Gm.)		105	1.5	11	—	—	.01	.2	15	—	.03	.02	.4
Fish:														
Cod, haddock cooked	1 medium serving	75	55	13.5	—	—	.01	.15	.4	—	1	.04	.06	1.6

TABLE 2 (*Continued*)

FOOD COMPOSITION TABLE FOR SHORT METHOD OF DIETARY ANALYSIS[1]

FOOD*	APPROXIMATE MEASURE	WT. Gm.	CALORIES	PROT. Gm.	FAT Gm.	CARBOHYDRATE Gm.	Ca Gm.	P Gm.	Fe mg.	VIT. A I.U.	ASCORBIC ACID mg.	THIAMINE mg.	RIBOFLAVIN mg.	NIACIN mg.
Halibut, herring, tuna, whitefish, cooked	1 medium serving tuna (60 Gm.); others (75 Gm.)	60	115	17.0	5	—	.01	.19	.8	60	—	.04	.06	6.0
Salmon, cooked	1 medium serving....	75	125	15.0	7	—	.11	.23	.8	135	—	.02	.12	5.6
Fruits:														
Banana	1 small............	100	90	1.0	—	22	.01	.03	.6	430	10	.04	.05	.7
Cantaloupe	½ melon, 4½-in. diam............	150	30	1.0	—	7	.02	.02	.6	5,130	50	.07	.06	.8
Citrus	1 medium orange; ½ medium grapefruit; ½ c. juice; 1 medium large lemon...........	100	45	.5	—	11	.03	.02	.4	115	45	.06	.02	.2
Yellow—fresh, canned, dried	fresh (100 Gm.); 1 medium peach, 2 to 3 apricots, 3 plums; dried (30 Gm.); for sweetened, canned, dried or fresh add ½ serving sweets....		70	.5	—	17	.01	.03	.6	910	6	.01	.03	1.0
Other—dried	3 to 4 dates; 1½ to 2 small figs; dried apple; ¼ c. raisins.	30	80	.5	—	20	.03	.03	.9	15	—	.04	.03	.3
Other—fresh and canned	½ c...............	100	55	.5	—	13	.01	.01	.4	95	4	.04	.03	.2

Gravy, *white sauce*	¼ c.	65	105	2.5	8	6	.07	.06	.2	225	—	.04	.11	.2
Legumes:														
Beans, peas	½ c. cooked; dried (30 Gm.)		100	6.5	—	18	.05	.13	2.0	10	1	.19	.07	.7
Soybeans	½ c. cooked; dried (30 Gm.)		105	10.5	5	4	.07	.18	2.4	35	—	.32	.09	.7
Meat:														
Beef, lamb, veal, cooked	1 medium serving	75	240	19.0	18	—	.01	.15	2.3	—	—	.07	.17	3.7
Fowl, cooked	1 medium serving	75	150	15.0	10	—	.01	.16	1.7	—	—	.04	.08	5.2
Liver, cooked	1 small serving	60	125	14.0	5	6	.01	.29	4.7	32,100	19	.16	2.38	8.9
Luncheon meats, cooked	2 sl. sausage, minced ham, dried beef, luncheon roll (30 Gm.); ½ frankfurter		85	6.0	7	—	.01	.05	.9	—	—	.08	.08	.8
Pork, ham, cooked	1 medium serving	75	280	18.0	23	—	.01	.16	2.2	—	—	.47	.17	3.5
Nuts:	1 tbsp. peanut butter; 8 to 15 walnut halves; 16 peanuts; 12 to 15 almonds; 12 pecan halves	15	90	4.0	7	3	.01	.06	.3	—	—	.04	.02	2.3
Sweets:														
Candy, sugar, sirup	1 tbsp. sugar, jelly, jam, sirup, honey; 1 serving plain Jello, plain candy (fondant or mints, 14 Gm.); 6-oz. bottle soft drink		55	—	—	14	—	—	—	—	—	—	—	—

Table 2 (*Continued*)

FOOD COMPOSITION TABLE FOR SHORT METHOD OF DIETARY ANALYSIS[1]

FOOD*	APPROXIMATE MEASURE	WT. Gm.	CALORIES	PROT. Gm.	FAT Gm.	CARBOHYDRATE Gm.	Ca Gm.	P Gm.	Fe mg.	VIT. A I.U.	ASCORBIC ACID mg.	THIAMINE mg.	RIBOFLAVIN mg.	NIACIN mg.
Candy bar	1 2-oz. chocolate-coated bar.......		290	4.0	15	34	.06	.09	1.1	65	—	.04	.17	1.1
Molasses; sorghum	1 tbsp.............	20	50	—	—	13	.04	.01	1.8	—	—	.02	.03	.6
Vegetables:														
Cabbage—cooked and sauerkraut	⅔ c................	100	25	1.5	—	5	.05	.03	.5	90	30†	.05	.05	.3
Cabbage, raw; cauliflower, cooked	1 c. cabbage (50 Gm.); ⅔ c. cauliflower (70 Gm.)...		15	1.0	—	3	.02	.03	.5	50	22	.04	.04	.2
Corn; parsnips, cooked	½ c. corn; 1 large parsnip..........	100	85	2.0	1	19	.03	.07	.6	195	10‡	.07‡	.09‡	.6‡
Green and yellow:														
Asparagus, cooked	⅔ c................	100	20	2.0	—	3	.02	.05	1.0	1,040	18‡	.13‡	.17‡	1.2
Broccoli, cooked	⅔ c................	100	30	3.0	—	5	.13	.08	1.3	3,400	74	.07	.15	.8
Carrots, cooked	⅔ c................	100	30	.5	—	7	.03	.03	.6	12,500	4‡	.05‡	.05‡	.4‡
Green beans, cooked	½ c................	100	25	1.5	—	5	.04	.02	.7	660	14‡	.07‡	.10‡	.5‡
Leafy green, cooked	⅔ c. spinach, turnip, kale, other greens..	100	30	2.5	—	5	.20§	.05	2.7	10,400	33‡	.08‡	.21‡	.6‡
Peas, fresh, cooked, canned	½ c................	100	70	4.0	—	13	.02	.09	1.8	630	15‡	.25‡	.14‡	2.3‡
Sweet potato, cooked	½ large............	100	140	2.0	1	31	.03	.05	.8	8,605	22‡	.10‡	.06‡	.7‡
Potato, cooked	1 small (100 Gm.); for fried add 1 to 2 servings fat; for													

	French fried (50 Gm.) add 1 to 2 servings fat......		85	2.0	—	19	.01	.06	.7	20	14‡	.09‡	.03	1.0
Tomato, fresh, canned, or juice	½ c.; 1 small tomato (100 Gm.); for 2½ tbsp. catsup (50 Gm.), add ½ serving sweets.......		20	1.0	—	4	.01	.02	.5	1,035	18	.05	.03	.8
Other, cooked	½ c. beets, eggplant, onions, etc.......	100	40	1.0	—	9	.03	.05	.6	80	8	.03	.04	.3
Other, commonly served raw	2 pieces celery; 8 sl. cucumber; ⅛ head lettuce..........	50	10	.5	—	2	.02	.02	.2	105	4	.02	.03	.2

[1] Leichsenring, J. M., and Wilson, E. D.: J. Am. Dietet. A. 27:386, 1951.

* The nutritive value of food mixtures such as maraconi and cheese, Spanish rice, chow mein, creamed vegetables, soups and so on should be computed on the basis of the kind and the approximate amount of the foods in the combination.

† For sauerkraut, reduce by one half.

‡ For canned, reduce by one half.

§ Calcium may be unavailable in chard, spinach and beet greens.

(*Explanation of use of Table 2 on following page*).

TABLE 2 (*Continued*)

FOOD COMPOSITION TABLE FOR SHORT METHOD OF DIETARY ANALYSIS

EXPLANATION OF USE OF TABLE 2

To illustrate the use of the food composition table, a sample day's menu from one of the homemaker's record is given below:

Breakfast

Tomato juice	1 serving
Oatmeal	1 serving
Cream (light)	2 servings
Sugar	2 tsp.
Bread, white enriched	1 sl.
Butter	1 tsp.
Milk, whole	1 c.

Lunch

Macaroni and cheese	1 serving
Head lettuce, French dressing	1 serving
Applesauce, sweetened	1 serving
Cupcake	1
Bread, whole wheat	1 sl.
Butter	1 tsp.
Milk, whole	1 c.

Midafternoon

Chocolate bar	1

Dinner

Liver	1 small serving
Potato, baked	1 small
Butter	2 tsp.
Green beans, buttered	1 serving
Celery	2 pieces
Bread, white enriched	1 sl.
Butter	1 tsp.
Chocolate pie	1 serving
Milk, whole	1 c.

This day's menu may be summarized as follows in preparing to calculate the nutritive value from the figures in Table 2:

FOODS	SERVINGS
Cereals:	
Refined	1
Whole grain or enriched	4
Dairy products:	
Butter	5½
Cheese, Cheddar	1
Cream, light	2
Milk, whole	3¼
Desserts:	
Cake, plain	⅔
Pie crust	1
Pudding	1
Fruit: other, fresh or canned	1
Meat: liver	1
Sweets	1
Candy bar	1
Vegetables:	
Green beans	1
Potato	1
Tomato	1
Other, raw	1

TABLE 3

100-CALORIE PORTIONS OF FOODS

	APPROXIMATE MEASURE PROVIDING 100 CALORIES	Wt. Gm.
Baked Goods, Bread, Cake, Cookies:		
Biscuits, baking powder	1 average, 2 in. diam.	29
Bread, white or whole wheat	1⅔ sl.	39
Cake:		
Angel food	2 in. section	36
Plain	1 square, 2 in. x 2 in. x 1½ in.	31
Cookies, plain	1 cookie, 3 in. diam.	23
Cornbread	1 piece, 2 in. square	46
Crackers:		
Graham	7 small	26
Saltines	6 crackers, 2 in. square	23
Doughnut	1 small	24
Griddlecake	2 cakes, 3 in. diam.	46
Muffin, plain wheat	1 muffin, 2 in. diam.	36
Roll, plain	1 average	32
Waffle, plain	½ waffle, 5 in. diam.	35
Cereals:		
Cornflakes	1 c.	26
Farina, dry	1 oz. (¾ c. cooked)	27
Oatmeal, dry	1 oz. (⅔ c. cooked)	26
Rice, puffed	1¾ c.	26
Rice, dry	1 oz. (¾ c. cooked)	27
Wheat, puffed	2 c.	28
Wheat, shredded biscuit	1 large biscuit	28
Desserts:		
Apple Betty	¼ c.	66
Chocolate blanc mange	¼ c.	66
Custard, baked	⅓ c.	81
Gingerbread	1 piece, 2 in. x 1 in. x 2 in.	30
Ice Cream, plain	⅜ c.	48
Pie:		
Apple, cherry, mince	1¼ in. section of 9 in. pie	49
Custard, pumpkin	1½ in. section of 9 in. pie	49
Rice pudding with raisins	⅓ c.	60
Sherbets	½ c. scant	81
Tapioca cream	⅔ c.	79
Eggs and Dairy Products:		
Eggs:		
Boiled or poached	1 large or 2 small	61
Scrambled or omelet	1 egg	58
Butter or margarine	1 tbsp.	14

TABLE 3 (*Continued*)

100-CALORIE PORTIONS OF FOODS

	Approximate Measure Providing 100 Calories	Wt. Gm.
Eggs and Dairy Products (*Continued*)		
Cream:		
Light, 20 per cent	3⅓ tbsp.	49
Heavy, 35 per cent	2 tbsp.	30
Cheese:		
Cheddar	1 in. cube	25
Cottage	5-6 tbsp.	105
Cocoa beverage, all milk	⅖ c.	105
Milk:		
Fresh	⅝ c.	147
Skim, fluid	1⅛ c.	278
Fruits:		
Apple	2 small	172
Applesauce with sugar	½ c.	139
Apricots, dried, cooked (no sugar)	½ c. scant (approx. 10 halves)	117
Banana	1 medium	113
Blueberries, fresh	1¼ c.	164
Cantaloupe	1½—4 in. diam.	500
Dates or figs, dried	3-4 dates pitted	35
Grapes, American type	1 large bunch, 35 avg.	147
Grape juice, commercial	½ c. plus	149
Grapefruit	½ large, 5 in. diam.	250
Orange	1 large, 3⅜ in. diam.	222
Peaches, fresh	2½ medium	217
Pears, fresh	1½ medium	158
Pineapple, fresh	1¼ c.	192
Pineapple, canned, with sugar	½ c.	128
Plums, fresh	4 medium	200
Prunes, cooked	5 medium plus 2 tbsp. sirup	80
Raisins	¼ c. scant	27
Rhubarb, cooked with sugar	¼ c.	71
Meats, Poultry and Sea Food:		
Beef:		
Dried beef	⅓ c.	50
Hamburg, cooked	1 oz.	27
Liver, fried	1¾ ozs.	48
Roast, rib, cooked	1 oz.	31
Steak, sirloin, cooked	1¼ ozs.	34
Stew with vegetables	⅓ c.	93
Chicken, canned, meat only	¼ c.	50
Lamb:		
Rib chop, cooked	1 small chop	24
Roast leg, cooked	1¼ ozs.	36

TABLE 3 (*Continued*)

100-CALORIE PORTIONS OF FOODS

	APPROXIMATE MEASURE PROVIDING 100 CALORIES	Wt. Gm.
Pork:		
Bacon, cooked	2 sl.	16
Ham	1 oz.	25
Ham, luncheon style	1¼ ozs.	35
Sausage, canned	1 link, 3 in. long	33
Sea Food:		
Crab, canned	½ c.	96
Halibut, cooked	2 ozs.	55
Lobster, canned	⅔ c.	108
Mackerel, canned	2 ozs.	56
Oysters, raw	½ c. 6-9 medium	119
Salmon, red, canned	⅓ c.	58
Tuna, canned	¼ c.	50
Veal:		
Cutlet, cooked	1⅔ ozs.	46
Stew meat, cooked	1¼ ozs.	34
Nuts:		
Brazil nuts	2 medium	15
Peanuts, roasted	18-20 nuts	18
Pecans	10-12 halves	14
Walnut, English	8-15 halves	15
Soups:		
Bean	½ c.	132
Bouillon, broth, consommé	10 c.	2500
Chicken	1⅓ c.	333
Clam chowder	1 c.	294
Cream soup, asparagus celery, mushroom	½ c.	127
Pea	⅔ c.	175
Tomato	1 c.	270
Vegetable	1⅕ c.	303
Vegetables:		
Asparagus, cooked	30 spears, medium size	500
Beans:		
Baked	⅓ c.	80
Lima, cooked	⅔ c.	105
Snap, cooked	3⅔ c.	455
Beets, cooked, diced	1½ c.	244
Cabbage, shredded finely	4 c.	417
Carrots, raw	4 medium	238
Cauliflower, cooked	3⅓ c.	400
Celery, raw, diced	5½ c.	555
Corn, cooked	¾ c.	118
Cucumbers	3 cucumbers, 7 in. x 2 in. diam.	833

TABLE 3 (*Continued*)

100-CALORIE PORTIONS OF FOODS

	Approximate Measure Providing 100 Calories	Wt. Gm.
Vegetables (*Continued*)		
Lettuce	1 head, 1½ lbs.	666
Onions, raw	2 onions, 2½ in. diam.	222
Parsnips, cooked	1 c.	166
Peas, cooked	1 c. scant.	143
Potatoes:		
Baked	1 medium, 2½ in. diam.	102
French fried	5 pieces, 2 in. x ½ in. x ½ in.	25
Radishes	50 small	500
Spinach, cooked	2 c.	385
Squash:		
Summer, cooked	3 c.	628
Winter, cooked	1 c.	263
Tomatoes, raw	4-5 small	500
Turnips, cooked	2 c.	333
Miscellaneous:		
Beverages, carbonated:		
Gingerale	10 ozs.	286
Other, cola type	7 ozs.	217
Candy:		
Caramels	2 medium	24
Fudge, plain	1 1 in. square	24
Hard candies	3 small	26
Marshmallows	4 average	31
Chocolate, sweetened, milk	½ of 5¢ bar	19
French dressing	1½ tbsp.	26
Honey, strained	1⅔ tbsp.	34
Jellies or jams	2 tbsp.	39
Mayonnaise	1 tbsp.	14
Olives, ripe, Mission type	8 large	52
Peanut butter	1 tbsp.	17
Sirup, table blend	1⅔ tbsp.	35
Sugar	2 tbsp.	26

TABLE 4

FOODS ARRANGED APPROXIMATELY ACCORDING TO CARBOHYDRATE CONTENT

E. P. Joslin *

Vegetables (fresh or canned)

5 PER CENT †		10 PER CENT †	15 PER CENT	20 PER CENT
1-3 PER CENT	3–5 PER CENT			
Lettuce	Tomatoes	String beans	Green peas	Potatoes
Cucumbers	Water cress	Pumpkin	Jerusalem artichokes	Shell beans
Spinach	Seakale	Turnip	Parsnips	Baked beans
Asparagus	Cauliflower	Squash	Lima beans (young)	Lima beans
Rhubarb	Eggplant	Beets		Green corn
Endive	Cabbage	Carrots		Boiled rice
Marrow	Radishes	Onions		Boiled macaroni
Sorrel	Leeks	Green peas (very young)		
Sauerkraut	String beans (very young)	Brussels sprouts		
Beet greens	Broccoli	Okra		
Dandelions	French artichokes			
Swiss chard	Green pepper			
Celery	Summer squash			
Mushrooms	Kohlrabi			

* Joslin, E. P.: Diabetic Manual, Philadelphia, Lea, 1937.

† Reckon average carbohydrate in 5 per cent vegetables as 3 per cent; of 10 per cent as 6 per cent.

Table 5

FRUITS AND VEGETABLES

Classified According to Carbohydrate Content *

Group I 3 Per Cent Carbohydrate (For protein and fat content see below)	Group II 6 Per Cent Carbohydrate (For protein and fat content see below)	Group III 9 Per Cent Carbohydrate (For protein and fat content see below)
Vegetables Chiefly leafy, salad	Vegetables Chiefly green, yellow	Vegetables Chiefly roots, tubers
Asparagus, fresh and canned Beans, green and wax, canned Bean sprouts Cabbage, cauliflower, broccoli, sauerkraut Greens: beet, chard, mustard, spinach, turnip Salad vegetables: celery, chicory, cucumbers, endive, lettuce, radishes, romaine, tomatoes Squash, summer Tomato juice	Beans, snap and wax, fresh Carrots, canned Greens: collards, dandelion, kale Eggplant Okra Peppers, green and red, fresh Pumpkin Turnips, fresh	Artichokes, globe or French, fresh Beets, fresh and canned Brussels sprouts, fresh Carrots, fresh Onions, fresh Peas, fresh (very young) and canned Squash, winter Rutabagas, fresh
Fruits †	Fruits †	Fruits †
Canned—w.p. Rhubarb Strawberries	*Canned*—w.p. Blackberries, gooseberries, peaches, plums, strawberries *Fresh* Melons: cantaloupe, casaba, honeydew, watermelon Strawberries	*Canned*—w.p. Applesauce, apricots, blackberries, blueberries, cherries, grapefruit, loganberries, pears, prunes, raspberries *Canned*—j.p. Peaches *Fresh* Blackberries, cranberries, gooseberries, grapefruit, tangerines
Protein Content Vegetables, 2 per cent Fruits, 1 per cent Fat content—negligible	Protein Content Vegetables, 2 per cent Fruits, 1 per cent Fat content—negligible	Protein Content Vegetables, 3 per cent Fruits, 1 per cent Fat content—negligible

TABLE 5 (*Continued*)

FRUITS AND VEGETABLES

Classified According to Carbohydrate Content

Group IV 12 Per Cent Carbohydrate	Group V 15 Per Cent Carbohydrate	Group VI 18 Per Cent Carbohydrate
VEGETABLES	VEGETABLES	VEGETABLES
Beans, Lima, canned	Beans, red kidney, canned Corn, sweet, very young Jerusalem artichoke, tubers Peas, fresh, med. mature Roots: parsnips, vegetable oyster (or salsify)	Corn, sweet, canned Potatoes, white Succotash, canned
FRUITS †	FRUITS †	FRUITS †
Canned—w.p. Figs, grapes, pineapple *Canned*—j.p. Applesauce, apricots, cherries, red and white; loganberries, pears, raspberries *Fresh* Apricots, cherries, sour Citrus: kumquats, oranges Berries: loganberries, raspberries Peaches, pineapple, plums *Juices* Apple, grapefruit, unsweetened; orange, pineapple	*Canned*—w.p. Cherries, black *Canned*—j.p. Pineapple *Fresh* Apples, blueberries, grapes, nectarines, pears *Juices* Blueberry, fresh	*Canned*—j.p. Cherries, black Prunes *Fresh* Cherries, sweet Figs, crabapples *Juices* Grape, fresh or bottled Prune, canned
Protein Content Vegetables, 5 per cent Fruits, 1 per cent Fat content—negligible	Protein Content Vegetables, 3 per cent Fruits, 1 per cent Fat content—negligible	Protein Content Vegetables, 3 per cent Fruits, 1 per cent Fat content—negligible

* The above tables are based upon the classification given by Adams and Chatfield, J. Am. Dietet. A. **10**: 383, 1935, and Proximate Composition of American Food Materials, circular No. 549, U. S. Department of Agriculture, 1940.

† The canned fruits are either water-pack or juice-pack, designated as w.p. and j.p., respectively. The latter is slightly higher in carbohydrates.

TABLE 6

CHOLESTEROL CONTENT OF FOODS*

	MG. PER 100 GM.
Meats:	
Beef, round:	
Med. fat	125
Lean	95
Lamb, muscle, free of fat	70
Pork, muscle, free of fat	60
Rabbit, muscle, free of fat	50
Veal	100–140
Organ meats:	
Brain, beef	2,300
Heart, beef	145
Kidney, beef	400
Liver:	
Beef	320
Calf	360
Lamb	610
Pork	420
Sweetbreads	280
Tripe	150
Fish:	
Codfish	50
Oyster†	230–470
Salmon	60
Shrimp†	150
Tuna, canned, oil removed	60
Fowl:	
Chicken:	
Lean muscle	60– 90
Whole bird	113
Breast with skin	89
Duck, lean muscle	70
Turkey, lean muscle	75

	MG. PER 100 GM.
Dairy products:	
Butter	280
Cheese:	
Whole milk	135–160
Cottage	1.7
Cream, 25% fat	87
Eggs:	
Whole	468
Yolk	1,330
White	0
Milk:	
Whole, 4% fat	14
Skim, 1% fat	0.4
Miscellaneous:	
Fish liver oils:	
Cod	500
Halibut	7,500
Lard	110
Beef suet, kidney	107
Beef fat, other	90
Mutton tallow, kidney	122
Mutton fat, from chops	89
Pork fat, from chops	99

Fruits, vegetables, cereals, bouillon cubes and soup stock without fat contain no cholesterol.

* Table adapted from Okey, R.: Cholesterol content of foods, J. Am. Dietet. A. **21**:341, 1945; Dobbin, E. V., et al.: Low Fat, Low Cholesterol Diet, Doubleday, 1951; Pihl, A.: Scandinav. J. Clin. & Lab. Invest. **4**:116, 1952.

†Oysters and shrimp are known to contain other sterols than cholesterol.

TABLE 7

SODIUM CONTENT OF FOODS*

Mg. per 100 Gm.

Fruits, fresh and canned:

	MG.
Apples:	
Less skin and core	0.1
Sauce, canned	0.3
Apricots:	
Fresh	0.6
Canned in sirup	2
Avocados	3
Bananas	0.5
Blackberries	0.2
Blueberries	0.6
Cantaloupe	12
Cherries:	
Sweet fresh or frozen	1
Canned in sirup	3
Sour, frozen in sirup	2
Cranberries	1
Currants, red	2
Figs, canned in sirup	1
Fruit cocktail, canned in sirup	9
Grapefruit:	
Fresh	0.5
Juice, canned	0.4
Sections, sweetened, frozen	5
Grapes:	
Thompson seedless with skin	4
Concord, less skin and seeds	3
Tokay, less seeds, with skins	0.7
Grape juice, bottled	1
Lemons, pulp and juice	0.7
Lime, pulp and juice	1
Nectarine, less skin	2
Oranges:	
Juice and pulp, fresh	0.3
Juice, canned, unsweetened	0.5
Marmalade	13
Peaches:	
Fresh, less skin	0.5
Canned in sirup	5
Frozen in sirup	3
Pears:	
Bartlett, fresh, less skin and core	2
Canned in sirup	8
Pineapple:	
Fresh	0.3
Canned in sirup	1
Juice, unsweetened, canned	0.5

	MG.
Plums:	
Fresh	0.6
Canned in sirup	18
Pomegranate, pulp and juice	0.3
Quince, fresh, less skin and core	0.7
Raspberries, black	0.3
Raspberries, red	0.5
Rhubarb, raw	1
Strawberries:	
Fresh	0.8
Frozen	2
Tangerine, pulp and juice	2
Watermelon, pink pulp	0.3

Dried Fruits:

	MG.
Apricots, dried	11
Currants, Zanti, dried	22
Date, semi-dry	1
Fig, dried	34
Peaches, dried	12
Prune, dried	6
Raisin, seedless	21

Vegetables, fresh, frozen and dried:

(Most commercially canned vegetables are omitted in this table because salt usually is added in varying amounts. As a rule, the canned items listed are canned without added salt.)

	MG.
Asparagus tips:	
Fresh	2
Frozen	3
Beans, green:	
Fresh	0.9
Frozen	2
Beans, Lima:	
Fresh	1
Frozen	310
Beans, Navy, dry	1
Beets:	
Fresh	110
Canned	36
Beet greens	130
Broccoli:	
Fresh	16
Frozen	13

TABLE 7 (*Continued*)

SODIUM CONTENT OF FOODS*

Mg. per 100 Gm.

Vegetables, fresh, frozen and dried (*Continued*)	MG.
Brussels sprouts:	
Fresh	11
Frozen	9
Cabbage	5
Carrot, scraped and trimmed	31
Cauliflower:	
Fresh	24
Frozen	22
Celery stalk, less leaves	110
Corn, sweet:	
Fresh	0.4
Frozen	9
Cowpeas, fresh, shelled	2
Cucumber, less parings	0.9
Dandelion greens	76
Eggplant, less skin	0.9
Endive, greens	18
Kale, leaves and midribs	110
Lettuce:	
Head	12
Leaf	7
Mushrooms, fresh	5
Mustard greens, fresh	48
Okra pods, fresh	1
Onions, white	1
Parsnips, scraped and trimmed	7
Peas:	
Fresh	1
Frozen	100
Peas, dry split	42
Peppers, green pods	0.6
Potatoes:	
Sweet, raw, less skin	4
White, raw, less skin	0.8
Pumpkin:	
Raw	0.6
Canned	2
Radish, with skin	9
Spinach:	
Fresh, raw	82
Frozen	60
Squash:	
Summer, yellow, less rind	0.6
Winter, Hubbard or acorn	0.4
Frozen, cooked	6
Tomatoes:	
Fresh with skin	3
Canned	18
Juice, canned	230
Turnips:	
White, raw	37
Yellow, rutabaga	5
Turnip tops, leaves	10
Cereals and Breads:	
Barley, pearled	3
Bread:	
Wheat, white, enriched	640
Whole wheat	930
Low sodium—4 lab. samples	3
14 commercial "salt free" breads	28
Corn meal, yellow, degerminated	0.7
Corn flakes	660
Farina, plain	2
Cream of Wheat, enriched	90
Flour:	
Buckwheat	1
Rye, dark	1
White, enriched	1
Phosphated	13
Whole wheat, graham	2
Plain, dry	1
Macaroni	1
Oatmeal, raw, dry	2
Rice:	
Brown, raw	9
Polished, raw	2
Wild	7
Spaghetti	1
Tapioca, dry	5
Wheat:	
Puffed	4
Shredded	2
Zwieback	250
Dairy Products:	
Butter, unsalted	5
Cream (32% fat)	40
Cheese:	
American Swiss, cheddar	710
Cheddar	700
Cottage	290
Cream, Philadelphia	250

TABLE 7 (*Continued*)

SODIUM CONTENT OF FOODS*
Mg. per 100 Gm.

Dairy Products (*Continued*)

	MG.
Eggs:	
Whole	81
Whites only	110
Yolks only	26
Milk:	
Whole, fresh	50
Condensed, sweetened	140
Evaporated	100
Whole, dry	410

Meats and Poultry:

	MG.
Bacon, fried crisp	2,400
Beef, lean, raw	51
Chicken:	
Breast meat	78
Leg meat	110
Duck, domesticated:	
Breast meat	68
Leg meat	96
Heart, beef	90
Kidney, beef	210
Lamb:	
Chops	98
Leg, lean	78
Liver:	
Calf	110
Pig	77
Turkey	51
Pork:	
Medium lean, fresh	58
Ham, medium lean	1,100
Rabbit, domesticated:	
Foreleg	47
Loin	92
Veal, medium lean	48

Fish and Shellfish:

	MG.
Clams	180
Cod fish:	
Raw	60
Frozen fillets	400
Halibut:	
Raw	56
Steak, frozen	460
Lobster (boiled in tap water)	210
Oysters, raw	73
Salmon:	
Raw	48
Canned	540
Sardine in oil	510
Shrimp, raw	140
Tuna, canned:	
Commercial	800
Low salt, dietetic pack	40

Nuts, raw and unsalted:

	MG.
Almonds	3
Brazil nut	1
Cashew	14
Chestnut	2
Coconut, dry shredded	16
Filberts	1
Peanut, raw or roasted in shell	2
Walnut, English	2

Beverages:

	MG.
Coca-Cola	1
Cocoa:	
Dry powder, Hershey	5
Dutch process	57
Coffee:	
Roasted bean	2
Instant, Nescafé, dry	84
Tea, India-Ceylon-Java blend, dry leaves	4
Wine:	
Port	4
Sauterne	10

Spices:†

	MG.
Allspice, ground	120
Anise, seed	13
Basil, leaves	16
Caraway, seed	27
Cardamom, seed	22
Cassia, cracked	16
Celery seed	140
Celery flakes, dehydrated	2,300
Cinnamon, ground	21
Cloves, ground	21
Coriander seed	40
Curry powder	64
Dill seed	18
Fennel seed	52

TABLE 7 (*Continued*)

SODIUM CONTENT OF FOODS*
Mg. per 100 Gm.

	MG.
Spices (*Continued*)	
Fenugreek seed	86
Garlic powder	22
Ginger, ground	42
Mace, ground	82
Marjoram, leaf	49
Mint, flakes, dehydrated	43
Mustard, ground or seed	10
Nutmeg, ground	24
Onion powder	93
Paprika, ground	71
Parsley flakes, dehydrated	490
Pepper:	
Black, ground	19
Red, ground	28
White, ground	9
Poppy seed	11
Rosemary leaves	48
Saffron, Spanish	24
Sage	14
Savory, powdered	17
Sesame seed	60
Thyme, powdered	43
Turmeric, ground	66
Vanilla beans	18
Proprietary products:	
(Mead Johnson and Co.):	
Casec (calcium caseinate)	42
Lonalac:	
Dry	20
Reliquefied	2
Pabena, dry	640
Pablum, dry	620
(Dietene Co.):	
Meritene, dry	500
(National Drug Co.):	
Protinal, dry	30
Miscellaneous:	
Garlic	6
Gelatin, plain, dry	36
Honey	7
Horse-radish, prepared	96
Jam, grape	7
Maple sirup	14
Marmalade, orange	13
Olive:	
Green	2,400
Ripe	920
Olive Oil	0.2
Tobacco, chewing	1,600
Vanilla extract	1
Vinegar, cider	1
Yeast:	
Compressed	4
Dry, cultured—avg.	115

* Figures taken from Bills, C. E., *et al.*: Sodium and potassium in foods and waters, Am. Dietet. A 25:304, 1949, unless otherwise indicated.

† Adapted from Elvehjem, C. A., and Burns, C. H.: J.A.M.A. **148**:1033, 1952.

TABLE 8

THE METABOLIC REACTION OF FOODS*

(Excess of either acid or base as cc. or mEq. of normal acid or base per 100 Gm. of food. These figures are referred to as **degree** of acidity or alkalinity.)

FOOD	DEGREE OF ACIDITY
Meats, Fish and Poultry:	
Beef, round, lean	10.6
Chicken, boiled	20.7
Cod, fresh	5.5
Halibut, fresh	9.4
Ham, boiled	10.0
Liver, beef, raw	10.1
Mackerel, fresh	9.3
Oysters	10.3
Pork:	
Leg, roast	28.6
Loin, roast	14.6
Salmon, fresh	11.0
Turkey, roast	19.5
Veal	13.5
Eggs and Cheese:	
Eggs, whole	11.1
Cheese:	
Cheddar	5.5
Cottage	4.5
Bread, Cake, Cereals and Crackers:	
Bread:	
White	2.7
Whole wheat	7.3
Cake, plain	4.3
Crackers:	
Graham	8.5
Soda	8.2
Corn meal, raw	6.5
Doughnuts	7.3
Oatmeal:	
Raw	12.9
Cooked	2.0
Rice:	
White, raw	7.6
Cooked	2.6
Spaghetti:	
Raw	9.6
Cooked	2.1
Wheat meal, raw	12.0
Wheat, puffed	11.0
Nuts:	
Peanut butter	4.4
Peanuts	11.6
Walnuts	8.4
Miscellaneous:	
Corn, sweet	1.8
dried	6.0

FOOD	DEGREE OF ALKALINITY
Fruits:	
Apples, raw	3.7
Apricots, raw	6.8
Bananas	5.6
Cantaloupe	7.5
Cranberries†	3.2
Dates	11.0
Grapes	2.7
Grapefruit	6.4
Lemons	5.5
Oranges	6.1
Peaches	5.0
Pears	3.3
Pineapple, fresh	6.8
Plums†	4.8
Prunes, stewed†	7.8
Raisins	23.7
Vegetables:	
Beans:	
Lima, fresh	14.0
Navy:	
Canned	6.4
Dried	18.0
Snap, fresh	5.4
Beets	10.9
Cabbage	6.0
Carrots	10.8
Celery	8.4
Potatoes:	
Sweet	6.7
White	7.0
Spinach†	27.0
Squash, Hubbard	2.8

TABLE 8 (*Continued*)

THE METABOLIC REACTION OF FOODS*

FOOD	DEGREE OF ALKALINITY	FOOD	DEGREE OF ALKALINITY
Vegetables (*Continued*)		**Nuts:**	
Tomatoes, fresh	5.6	Almonds	12.0
Turnips	2.7		
Milk:		**Miscellaneous:**	
Milk, fresh, whole	1.8	Cocoa, beverage	2.9
Buttermilk	2.2	Gingerbread	8.7

Neutral Foods

Butter	Starches
Cream	Sugars
Cooking fats	Sirups

* Adapted from Bridges, M. A.: Dietetics for the Clinician, Philadelphia, Lea, 1941.
† Ash alkaline in vitro, partly acid in vivo.

TABLE 9

VALUES USED IN NUTRITION CALCULATIONS

Certain numerical values and constants are essential tools for the physician, the dietitian and the nurse. Those given on this page are used commonly in dietary calculations. For further details on them and on minerals and vitamins, see Recommended Dietary Allowances, Chapter 9.

NORMAL DIETARY REQUIREMENTS

	Adults: Gm./Kg.	Adults: Per cent of total calories	Children: Gm./Kg.	Children: Per cent of total calories
Protein	⅔–1½	10–15	2–3½	20
Fat	1–2	30–40	2–3	30
Carbohydrate	4–6	50–60	6–10	50

Calories (per kilo of normal wt.)

Adults		Children	
Basal rate	24 (1 cal./Kg./hr.)	Under 1 yr.	100
Bed rest	25–30	1–3 yrs.	100–90
Light exercise	25–40	4–6 yrs.	90–80
Moderate exercise	40–50	7–12 yrs.	80–60
Heavy muscular work	50–60	Girls 13–20 yrs.	60–45
		Boys 13–20 yrs.	70–60

NUMERICAL CONSTANTS PERTAINING TO FOOD VALUES

	Protein	Fat	Carbohydrate
Calorie value per gram in a mixed diet	4	9	4
Respiratory quotient (R.Q.)	0.8	0.7	1.0
Glucogenic fraction	58 per cent	10 per cent	100 per cent
Ketogenic fraction	46 per cent	90 per cent	...

Table 10

BLOOD STUDIES*

	Normal Range	Deviations in Disease: Decreased	Deviations in Disease: Increased
Hematology			
Red blood cells (erythrocytes)	4.5–5 millions per cu. mm.	Anemia Hemorrhage Chronic infectious diseases Prolonged dietary deficiency of iron	Polycythemia Dehydration
White blood cells (leukocytes)	5–10 thousand per cu. mm.	Leukopenia	Acute infections Leukemias
Hemoglobin	14–16 grams per cent	Anemias	Polycythemia Dehydration
Hematocrit	$\frac{\text{Red cells}}{\text{Serum}}$ = 42–46% cells	Anemia	Polycythemia
Chemistry			
Sugar	70–100 mg./100 cc.	Hyperinsulinism Addison's disease	Diabetes mellitus Cushing's syndrome
Nonprotein nitrogen	15–35 mg./100 cc.		Dehydration Renal disease
Uric Acid	3–5 mg./100 cc.		Gout Nephritis
Urea nitrogen	Under 25 mg./100 cc.		Renal disease
Creatinine	Under 2 mg./100 cc.		Renal disease
Protein	6–8 Gm./100 cc.	Nephrosis Nephritis with edema	Multiple myeloma
Calcium	8.5–10.2 mg./100 cc.	Renal disease Hypoparathyroidism Chronic rickets Steatorrhea	Hyperparathyroidism Multiple myeloma
Potassium	5.0–5.5 mEq./liter	Periodic paralysis Diabetes	Addison's disease Renal disease
Sodium	139–144 mEq./liter	Diabetic acidosis Addison's disease Diarrhea Dehydration	Dehydration

TABLE 10 (*Continued*)

BLOOD STUDIES*

	Normal Range	Deviations in Disease: Decreased	Deviations in Disease: Increased
Chemistry (*Continued*)			
Phosphorus	3.2–4.0 mg./100 cc.	Rickets Renal disease Hyperparathyroidism	Hypoparathyroidism Renal disease Diabetic coma
Chloride	99–104 mEq./liter	Renal disease Addison's disease	Dehydration Renal disease
Cholesterol	150–280 mg./100 cc.	Pernicious anemia Malnutrition Hyperthyroidism	Pregnancy Biliary obstruction Myxedema Uncontrolled diabetes Renal disease
Bilirubin	Under 0.5 mg./100 cc.		Jaundice
Phosphatase (alkaline)	3–5 units/100 cc.		Certain bone diseases
Vitamin C	0.5–1.4 mg./100 cc.	Infection Dietary deficiency Leukemia Cirrhosis	
Vitamin A	40–100 I.U./100 cc.	Infectious hepatitis Myxedema Malnutrition	
Carbon dioxide	27–30 mEq./liter	Metabolic acidosis Hypoventilation	Metabolic acidosis Hyperventilation

*Diet Manual of the Massachusetts General Hospital, 1950.

TABLE 11

EQUIVALENT WEIGHTS AND MEASURES

Weight Equivalents

	MILLIGRAM	GRAM	KILO-GRAM	GRAIN	OUNCE	POUND
1 microgram (mcg.)	.001	.000001				
1 milligram (mg.)	1.	.001		.0154		
1 gram (Gm.)	1,000.	1.	.001	**15.4**	.035	.0022
1 kilogram (Kg.)	1,000,000.	1,000.	1.	15,400.	35.2	2.2
1 grain (gr.)	64.8	.065		1.		
1 ounce (oz.)		**28.3**		437.5	1.	.063
1 pound (lb.)		**453.6**	.454		16.0	1.

Volume Equivalents

	CUBIC MILLIMETER	CUBIC CENTIMETER	LITER	FLUID OUNCE	PINT	QUART
1 cubic millimeter (cu. mm.)	1.	.001				
1 cubic centimeter (cc.)	1,000.	1.	.001			
1 liter (L.)	1,000,000.	1,000.	1.	33.8	2.1	1.05
1 fluid ounce		**30.**(29.57)	.03	1.		
1 pint (pt.)		**473.**	.473	16.	1.	
1 quart (qt.)		946.	**.946**	32.	2.	1.

Linear Equivalents

	MILLIMETER	CENTIMETER	METER	INCH	FOOT	YARD
1 millimeter (mm.)	1.	.1	.001	.039	.00325	.0011
1 centimeter (cm.)	10.	1.		.39	.0325	.011
1 meter (M.)	1,000.	100.	1.	39.37	3.25	1.08
1 inch (in.)	25.4	**2.54**	.025	1.	.083	.028
1 foot (ft.)	304.8	30.48	.305	12.	1.	.33
1 yard (yd.)	914.4	91.44	.914	36.	3.	1.

TABLE 11 (*Continued*)

EQUIVALENT WEIGHTS AND MEASURES

Comparative Values of Weight and Volume of Water

1 liter	= 1 kilo.	= 2.2	lb.
1 fluid ounce	= 30 Gm.	= 1.04	oz.
1 pint	= 473 Gm.	= 1.04	lb.
1 quart	= .946 kilo.	= 2.1	lb.

Table of Common Measures and Metric Equivalents

1 tsp.	= 5 cc.	
1 tbsp.	= 14 cc.	(approx. 15 Gm.)
1 cup	= 225 cc.	(approx. 240 Gm.)

(See Table of Measures and Approximate Weights, p. 423)

Comparative Temperatures

	CENTIGRADE DEGREES	FAHRENHEIT DEGREES
Boiling water, sea level	100	212
Body temperature	37	98.6
Room temperature, average	20	70
Freezing	0	32

Table 12

AVERAGE WEIGHT FOR HEIGHT TABLES *

For Girls from Birth to School Age †

HEIGHT (IN.)	1 MO.	3 MOS.	6 MOS.	9 MOS.	12 MOS.	18 MOS.	24 MOS.	30 MOS.	36 MOS.	48 MOS.	60 MOS.	72 MOS.
20	8											
21	9	10										
22	10	11										
23	11	12	13									
24	12	13	14	14								
25	13	14	15	15								
26	..	15	16	17	17							
27	..	16	17	18	18							
28	..	..	19	19	19	19						
29	..	..	19	20	20	20						
30	..	..	21	21	21	21	21					
31	..	..	..	22	22	23	23	23				
32	..	..	..	..	23	24	24	24	25			
33	..	..	..	..	..	25	25	25	26			
34	..	..	..	..	..	26	26	26	27			
35	..	..	..	..	..	29	29	29	29	29		
36	..	..	..	..	..	..	30	30	30	30	31	
37	..	..	..	..	..	..	31	31	31	31	32	
38	..	..	..	..	..	..	..	33	33	33	33	
39	..	..	..	..	..	..	..	34	34	34	34	34
40	..	..	..	..	..	..	..	..	35	36	36	36
41	..	..	..	..	..	..	..	..	..	37	37	37
42	..	..	..	..	..	..	..	..	..	39	39	39
43	.	..	..	..	..	..	..	..	..	40	41	41
44	..	..	..	..	..	..	..	..	..	..	42	42
45	..	..	..	..	..	..	..	..	..	..	..	45
46	..	..	..	..	..	..	..	..	..	..	..	47
47	..	..	..	..	..	..	..	..	..	..	..	50
48	..	..	..	..	..	..	..	..	..	..	..	52

TABLE 12 (*Continued*)

AVERAGE WEIGHT FOR HEIGHT TABLES *

For Boys from Birth to School Age †

HEIGHT (IN.)	1 MO.	3 MOS.	6 MOS.	9 MOS.	12 MOS.	18 MOS.	24 MOS.	30 MOS.	36 MOS.	48 MOS.	60 MOS.	72 MOS.
20	8											
21	9	10										
22	10	11										
23	11	12	13									
24	12	13	14									
25	13	14	15	16								
26	..	15	17	17	18							
27	..	16	18	18	19							
28	..	..	19	19	20	20						
29	..	..	20	21	21	21						
30	..	..	22	22	22	22	22					
31	..	..	..	23	23	23	23	24				
32	..	..	..	24	24	24	25	25				
33	..	..	..	..	26	26	26	26	26			
34	..	..	..	..	..	27	27	27	27			
35	..	..	..	..	..	29	29	29	29	29		
36	..	..	..	..	..	..	30	31	31	31		
37	..	..	..	..	..	..	32	32	32	32	32	
38	..	..	..	..	..	..	..	33	33	33	34	
39	..	..	..	..	..	..	..	35	35	35	35	
40	..	..	..	..	..	..	..	..	36	36	36	36
41	..	..	..	..	..	..	..	..	..	38	38	38
42	..	..	..	..	..	..	..	..	..	39	39	39
43	..	..	..	..	..	..	..	..	..	41	41	41
44	..	..	..	..	..	..	..	..	..	..	43	43
45	..	..	..	..	..	..	..	..	..	..	45	45
46	..	..	..	..	..	..	..	..	..	..	..	48
47	..	..	..	..	..	..	..	..	..	..	..	50
48	..	..	..	..	..	..	..	..	..	..	..	52
49	..	..	..	..	..	..	..	..	..	..	..	55

TABLE 12 (*Continued*)

AVERAGE WEIGHT FOR HEIGHT TABLES *

For Girls from 5 to 18 Years ‡

HEIGHT (IN.)	5 YRS.	6 YRS.	7 YRS.	8 YRS.	9 YRS.	10 YRS.	11 YRS.	12 YRS.	13 YRS.	14 YRS.	15 YRS.	16 YRS.	17 YRS.	18 YRS.
38	33	33												
39	34	34												
40	36	36	36											
41	37	37	37											
42	39	39	39											
43	41	41	41	41										
44	42	42	42	42										
45	45	45	45	45	45									
46	47	47	47	48	48									
47	49	50	50	50	50	50								
48	..	52	52	52	52	53	53							
49	..	54	54	55	55	56	56							
50	..	56	56	57	58	59	61	62						
51	..	..	59	60	61	61	63	65						
52	..	..	63	64	64	64	65	67						
53	..	..	66	67	67	68	68	69	71					
54	..	..	..	69	70	70	71	71	73					
55	..	..	..	72	74	74	74	75	77	78				
56	..	..	..	..	76	78	78	79	81	83				
57	..	..	..	..	80	82	82	82	84	88	92			
58	..	..	..	..	..	84	86	86	88	93	96	101		
59	..	..	..	..	..	87	90	90	92	96	100	103	104	
60	..	..	..	..	..	91	95	95	97	101	105	108	109	111
61	..	..	..	..	..	..	99	100	101	105	108	112	113	116
62	..	..	..	..	..	..	104	105	106	109	113	115	117	118
63	..	..	..	..	..	..	...	110	110	112	116	117	119	120
64	..	..	..	..	..	..	...	114	115	117	119	120	122	123
65	..	..	..	..	..	..	...	118	120	121	122	123	125	126
66	..	..	..	..	..	..	...	...	124	124	125	128	129	130
67	..	..	..	..	..	..	...	...	128	130	131	133	133	135
68	..	..	..	..	..	..	...	...	131	133	135	136	138	138
69	..	..	..	..	..	..	...	...	...	135	137	138	140	142
70	..	..	..	..	..	..	...	...	...	136	138	140	142	144
71	..	..	..	..	..	..	...	...	...	138	140	142	144	145

TABLE 12 (*Continued*)

AVERAGE WEIGHT FOR HEIGHT TABLES *

For Boys from 5 to 19 Years ‡

HEIGHT (IN.)	5 YRS.	6 YRS.	7 YRS.	8 YRS.	9 YRS.	10 YRS.	11 YRS.	12 YRS.	13 YRS.	14 YRS.	15 YRS.	16 YRS.	17 YRS.	18 YRS.	19 YRS.
38	34	34													
39	35	35													
40	36	36													
41	38	38	38												
42	39	39	39	39											
43	41	41	41	41											
44	44	44	44	44											
45	46	46	46	46	46										
46	47	48	48	48	48										
47	49	50	50	50	50	50									
48	..	52	53	53	53	53									
49	..	55	55	55	55	55	55								
50	..	57	58	58	58	58	58	58							
51	..	..	61	61	61	61	61	61							
52	..	..	63	64	64	64	64	64	64						
53	..	..	66	67	67	67	67	68	68						
54	..	..	..	70	70	70	70	71	71	72					
55	..	..	..	72	72	73	73	74	74	74					
56	..	..	..	75	76	77	77	77	78	78	80				
57	..	..	..	..	79	80	81	81	82	83	83				
58	..	..	..	..	83	84	84	85	85	86	87				
59	..	..	..	..	..	87	88	89	89	90	90	90			
60	..	..	..	..	..	91	92	92	93	94	95	96			
61	..	..	..	..	..	..	95	96	97	99	100	103	106		
62	..	..	..	..	..	..	100	101	102	103	104	107	111	116	
63	..	..	..	..	..	..	105	106	107	108	110	113	118	123	127
64	..	..	..	..	..	..	...	109	111	113	115	117	121	126	130
65	..	..	..	..	..	..	...	114	117	118	120	122	127	131	134
66	..	..	..	..	..	..	...	...	119	122	125	128	132	136	139
67	..	..	..	..	..	..	...	...	124	128	130	134	136	139	142
68	..	..	..	..	..	..	...	...	...	134	134	137	141	143	147
69	..	..	..	..	..	..	...	...	...	137	139	143	146	149	152
70	..	..	..	..	..	..	...	...	...	143	144	145	148	151	155
71	..	..	..	..	..	..	...	...	...	148	150	151	152	154	159
72	..	..	..	..	..	..	...	...	...	...	153	155	156	158	163
73	..	..	..	..	..	..	...	...	...	...	157	160	162	164	167
74	..	..	..	..	..	..	...	...	...	...	160	164	168	170	171

* Metropolitan Life Insurance Company.
† Prepared by Robert M. Woodbury, Ph.D., Children's Bureau, U. S. Dept. of Labor.
‡ Prepared by Bird T. Baldwin, Ph.D., and Thomas D. Wood, M.D.

TABLE 13

HEIGHT-WEIGHT TABLES FOR MEN AND WOMEN

COMPARATIVE SIGNIFICANCE OF IDEAL VS. AVERAGE WEIGHTS FOR ADULTS

Tables of average weight for height for men and women at different ages, compiled by insurance companies from their records, were formerly used as the only guides to desirable weight. Evaluation of their statistics in terms of health and longevity disclosed that it was more advantageous to be slightly overweight under 30 and underweight over 30 as compared with average figures.

More recently the Metropolitan Life Insurance Co., after years of research, has published tables of ideal weights for adults which recognize differences in frame but do not allow for increases with age. The older tables of *average* weights at different ages are given along with those of *ideal* weights for comparison. It should be recognized, however, that control of body weight in line with the *ideal* rather than the *average* is more compatible with health and longevity.

IDEAL WEIGHTS FOR WOMEN AGED 25 AND OVER*

HEIGHT (WITH SHOES)		WEIGHT IN POUNDS (AS ORDINARILY DRESSED)		
FT.	IN.	SMALL FRAME	MEDIUM FRAME	LARGE FRAME
4	11	104–111	110–118	117–127
5	0	105–113	112–120	119–129
5	1	107–115	114–122	121–131
5	2	110–118	117–125	124–135
5	3	113–121	120–128	127–138
5	4	116–125	124–132	131–142
5	5	119–128	127–135	133–145
5	6	123–132	130–140	138–150
5	7	126–136	134–144	142–154
5	8	129–139	137–147	145–158
5	9	133–143	141–151	149–162
5	10	136–147	145–155	152–166
5	11	139–150	148–158	155–169

TABLE 13 (*Continued*)

IDEAL WEIGHTS FOR MEN AGED 25 AND OVER*

HEIGHT (WITH SHOES)		WEIGHT IN POUNDS (AS ORDINARILY DRESSED)		
FT.	IN.	SMALL FRAME	MEDIUM FRAME	LARGE FRAME
5	2	116–125	124–133	131–142
5	3	119–128	127–136	133–144
5	4	122–132	130–140	137–149
5	5	126–136	134–144	141–153
5	6	129–139	137–147	145–157
5	7	133–143	141–151	149–162
5	8	136–147	145–156	153–166
5	9	140–151	149–160	157–170
5	10	144–155	153–164	161–175
5	11	148–159	157–168	165–180
6	0	152–164	161–173	169–185
6	1	157–169	166–178	174–190
6	2	163–175	171–184	179–196
6	3	168–180	176–189	184–202

* Metropolitan Life Insurance Company.

TABLE 14

STANDARD TABLE OF HEIGHTS AND WEIGHTS*

WOMEN

Lightface Figures are 20 Per Cent Under and Over the Average

HEIGHTS		WEIGHTS ACCORDING TO AGE PERIOD								
FT.	IN.	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59
		88	90	93	95	98	101	103	105	106
4	11	**110**	**113**	**116**	**119**	**122**	**126**	**129**	**131**	**132**
		132	136	139	143	146	151	155	157	158
		90	92	94	97	99	102	105	106	107
5	0	**112**	**115**	**118**	**121**	**124**	**128**	**131**	**133**	**134**
		134	138	142	145	149	154	157	160	161
		91	94	96	98	101	104	106	108	110
	1	**114**	**117**	**120**	**123**	**126**	**130**	**133**	**135**	**137**
		137	140	144	148	151	156	160	162	164
		94	96	98	100	103	106	109	110	112
	2	**117**	**120**	**122**	**125**	**129**	**133**	**136**	**138**	**140**
		140	144	146	150	155	160	163	166	168
		96	98	100	102	106	109	111	113	114
	3	**120**	**123**	**125**	**128**	**132**	**136**	**139**	**141**	**143**
		144	148	150	154	158	163	167	169	172
		98	101	103	106	109	111	114	115	117
	4	**123**	**126**	**129**	**132**	**136**	**139**	**142**	**144**	**146**
		148	151	155	158	163	167	170	173	175
		101	103	106	109	112	114	117	118	120
	5	**126**	**129**	**132**	**136**	**140**	**143**	**146**	**148**	**150**
		151	155	158	163	168	172	175	178	180
		104	106	109	112	115	118	121	122	122
	6	**130**	**133**	**136**	**140**	**144**	**147**	**151**	**152**	**153**
		156	160	163	168	173	176	181	182	184
		107	110	112	115	118	121	124	126	126
	7	**134**	**137**	**140**	**144**	**148**	**151**	**155**	**157**	**158**
		161	164	168	173	178	181	186	188	190
		110	113	115	118	122	124	127	130	130
	8	**138**	**141**	**144**	**148**	**152**	**155**	**159**	**162**	**163**
		166	169	173	178	182	186	191	194	196
		113	116	118	122	125	127	130	133	134
	9	**141**	**145**	**148**	**152**	**156**	**159**	**163**	**166**	**167**
		169	174	178	182	187	191	196	199	200
		116	119	122	124	127	130	133	136	138
5	10	**145**	**149**	**152**	**155**	**159**	**162**	**166**	**170**	**173**
		174	179	182	186	191	194	199	204	208
		120	122	124	126	130	133	136	139	142
	11	**150**	**153**	**155**	**158**	**162**	**166**	**170**	**174**	**177**
		180	184	186	190	194	199	204	209	212
		124	126	127	130	132	135	138	142	146
6	0	**155**	**157**	**159**	**162**	**165**	**169**	**173**	**177**	**182**
		186	188	191	194	198	203	208	212	218

TABLE 14 (*Continued*)

STANDARD TABLE OF HEIGHTS AND WEIGHTS *

MEN

Lightface Figures are 20 Per Cent Under and Over the Average

HEIGHTS		WEIGHTS ACCORDING TO AGE PERIOD								
FT.	IN.	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59
4	11	89 **111** 133	94 **117** 140	98 **122** 146	100 **125** 150	102 **127** 152	104 **130** 156	106 **132** 158	106 **133** 160	107 **134** 161
5	0	90 **113** 136	95 **119** 143	99 **124** 149	102 **127** 152	103 **129** 155	106 **132** 158	107 **134** 161	108 **135** 162	109 **136** 163
	1	92 **115** 138	97 **121** 145	101 **126** 151	103 **129** 155	105 **131** 157	107 **134** 161	109 **136** 163	110 **137** 164	110 **138** 166
	2	94 **118** 142	99 **124** 149	102 **128** 154	105 **131** 157	106 **133** 160	109 **136** 163	110 **138** 166	111 **139** 167	112 **140** 168
	3	97 **121** 145	102 **127** 152	105 **131** 157	107 **134** 161	109 **136** 163	111 **139** 167	113 **141** 169	114 **142** 170	114 **143** 172
	4	99 **124** 149	105 **131** 157	107 **134** 161	110 **137** 164	112 **140** 168	114 **142** 170	115 **144** 173	116 **145** 174	117 **146** 175
	5	102 **128** 154	108 **135** 162	110 **138** 166	113 **141** 169	115 **144** 173	117 **146** 175	118 **148** 178	119 **149** 179	120 **150** 180
	6	106 **132** 158	111 **139** 167	114 **142** 170	116 **145** 174	118 **148** 178	120 **150** 180	122 **152** 182	122 **153** 184	123 **154** 185
	7	109 **136** 163	114 **142** 170	117 **146** 175	119 **149** 179	122 **152** 182	123 **154** 185	125 **156** 187	126 **157** 188	126 **158** 190
	8	112 **140** 168	117 **146** 175	120 **150** 180	123 **154** 185	126 **157** 188	127 **159** 191	129 **161** 193	130 **162** 194	130 **163** 196
	9	115 **144** 173	120 **150** 180	123 **154** 185	126 **158** 190	130 **162** 194	131 **164** 197	133 **166** 199	134 **167** 200	134 **168** 202

TABLE 14 (*Continued*)

STANDARD TABLE OF HEIGHTS AND WEIGHTS *

MEN (*Continued*)

Lightface Figures are 20 Per Cent Under and Over the Average

HEIGHTS		WEIGHTS ACCORDING TO AGE PERIOD								
FT.	IN.	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54	55–59
5	10	118 **148** 178	123 **154** 185	126 **158** 190	130 **163** 196	134 **167** 200	135 **169** 203	137 **171** 205	138 **172** 206	138 **173** 208
	11	122 **153** 184	126 **158** 190	130 **163** 196	134 **168** 202	138 **172** 206	140 **175** 210	142 **177** 212	142 **178** 214	143 **179** 215
6	0	126 **158** 190	130 **163** 196	135 **169** 203	139 **174** 209	142 **178** 214	145 **181** 217	146 **183** 220	147 **184** 221	148 **185** 222
	1	130 **163** 196	134 **168** 202	140 **175** 210	144 **180** 216	147 **184** 221	150 **187** 224	152 **190** 228	153 **191** 229	154 **192** 230
	2	134 **168** 202	138 **173** 208	145 **181** 217	149 **186** 223	153 **191** 229	155 **194** 233	158 **197** 236	158 **198** 238	159 **199** 239
	3	138 **173** 208	142 **178** 214	150 **187** 224	154 **192** 230	158 **197** 236	161 **201** 241	163 **204** 245	164 **205** 246	165 **206** 247

* Metropolitan Life Insurance Company, Statistical Bureau.

Special Tests

PROCEDURES CONCERNED WITH DIABETES MELLITUS

Simple Tests for Sugar and Diacetic Acid in the Urine

The urine of a diabetic is likely to contain appreciable amounts of those products which the body cannot metabolize. For this reason urinary tests are a convenient criterion for judging the severity of the disease or the success of its treatment. The nurse and the patient should both know how to make simple tests for sugar and diacetic acid. Sometimes these are made on samples of urine taken from a single voiding, sometimes on a 24-hour specimen. It is usually more significant for the physician to know at what hours of the day sugar is being passed in order that he may adjust the insulin dosage accordingly. Urine from chemically regulated diabetics on proper insulin dosage may contain small amounts or traces of sugar but no diacetic acid.

COLLECTION OF URINE

24-hour specimen

The urine voided at 7 A.M. should be discarded. All urine voided during the following 24 hours up to and including that at 7 A.M. the next morning should be collected in a glass jar and kept in a cool place. A two-quart Mason jar is convenient. One teaspoonful of toluol may be added as a preservative.

Periodic specimens

The physician may request a sugar test on urine voided before and after meals or at certain times of the day. In this case the samples are kept separately and preferably tested immediately.

BENEDICT QUALITATIVE TEST FOR SUGAR

Equipment necessary

- Test tubes—3 or more
- Teaspoon
- Medicine dropper
- Gas burner or alcohol lamp
- Benedict's qualitative solution

Directions for the test

Place 5 cc. (1 teaspoonful) of Benedict's solution in a test tube and add exactly 8 drops of the urine to be tested. Shake gently and heat over a free flame, allowing it to boil 1 minute. The tube may be heated in vigorously boiling water for 5 minutes with the same results. Allow the tube to cool spontaneously. The following color reactions indicate the amount of sugar present.

Clear blue: No change from the original solution = "sugar-free"

Green: Slight sediment on standing = trace of sugar present

Yellow or yellowish green: Yellow sediment = a few tenths per cent of sugar

Red or reddish brown: Heavy sediment = more than 1 per cent of sugar present

Test tubes must be cleaned thoroughly after each test. A test-tube brush will be most convenient for this purpose.

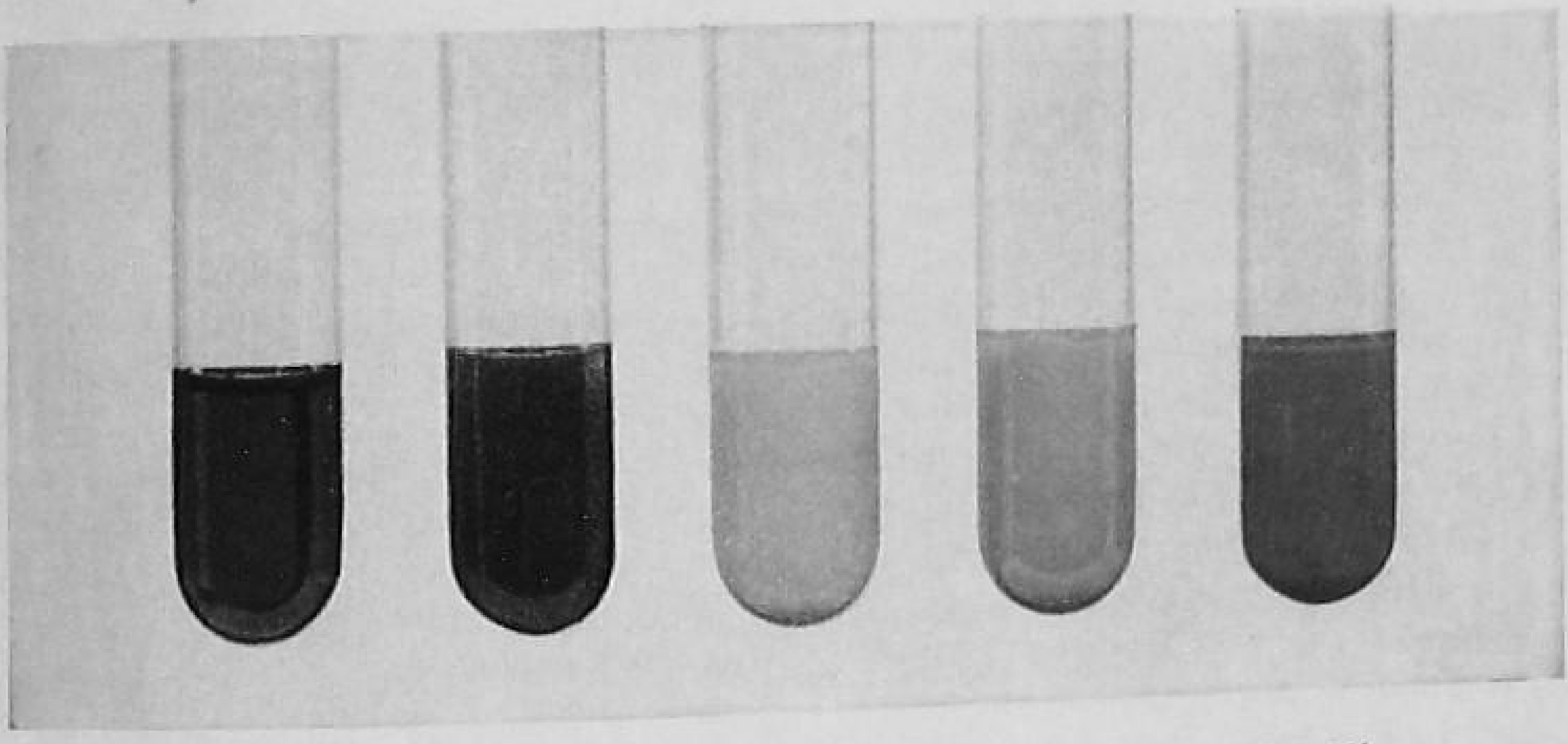
Benedict's qualitative solution may be purchased from hospital laboratories, drugstores or diabetic supply houses, or may be made according to the following directions:

BENEDICT'S SOLUTION	GM. OR CC.
Copper sulfate (pure crystallized)	17.3
Sodium or potassium citrate .	173.0
Sodium carbonate, crystallized. (If the anhydrous sodium carbonate is used, only one half of this amount should be taken)	200.0
Distilled water, to make	1000.0

The citrate and the carbonate are dissolved together with the aid of heat in about 700 cc. of water. The mixture is poured (through a filter, if necessary) into a large beaker.

Fig. 129. Sheftel set for home or emergency use. This set is designed for rapid estimation of the amount of sugar in the urine. It is accurate enough for clinical purposes. The directions contained in the folder which accompanies the set are clear and easy to follow. (Eli Lilly and Co.)

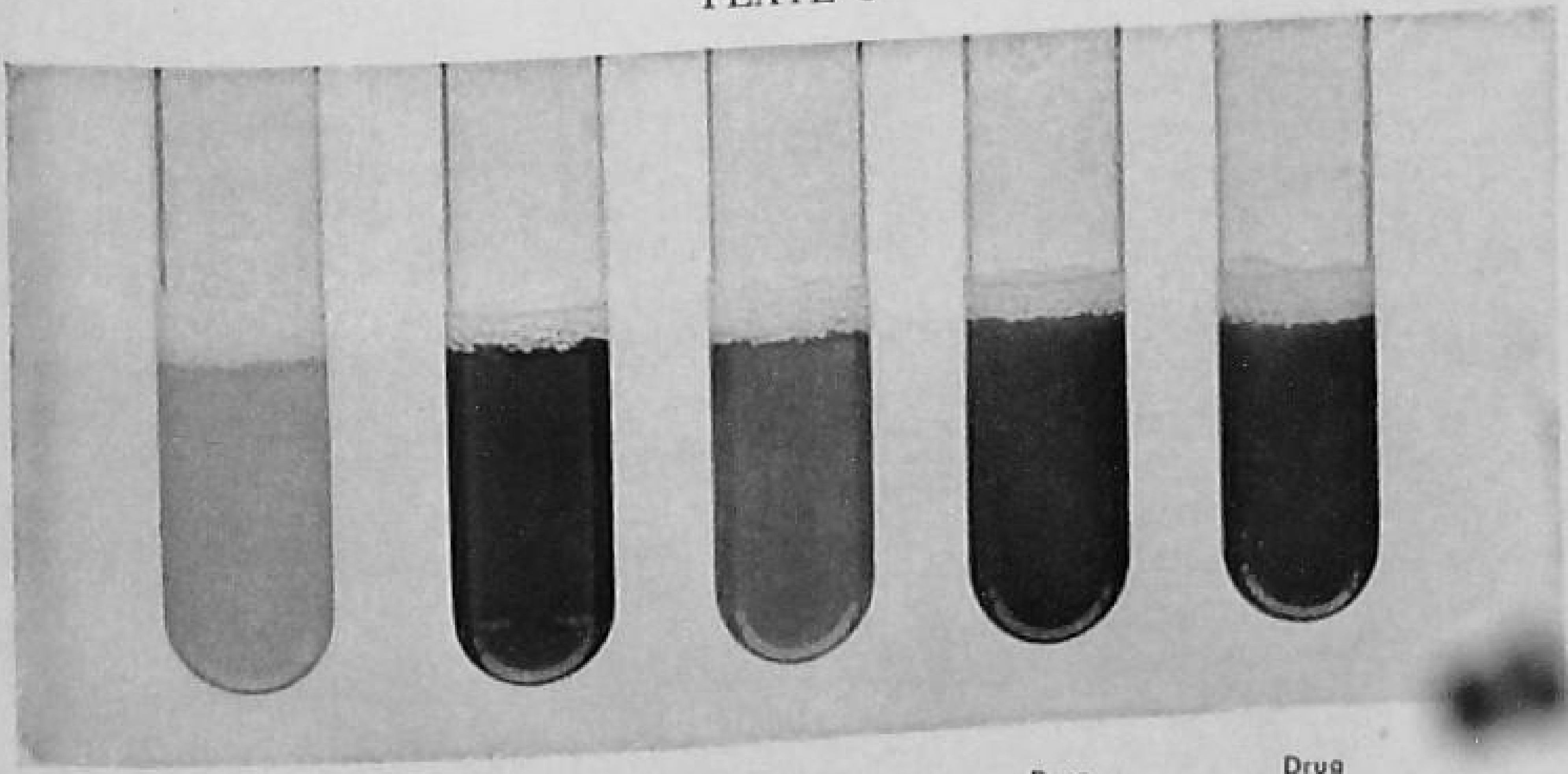
PLATE 4



Negative | 0.25% Sugar (+) | 1% Sugar (++) | More than 1% (+++) | Over 2% (++++)

Quantitative estimation from the Benedict qualitative test for sugar in urine. (Eli Lilly and Company)

PLATE 5



Negative | Positive (Before Boiling) | Positive (After Boiling) | Drug (Before Boiling) | Drug (After Boiling)

Test for acetoacetic (diacetic) acid Gerhardt's test (Eli Lilly and Company)

The copper sulfate is dissolved separately in about 100 cc. of water and is poured slowly into the first solution, with constant stirring. The mixture is cooled and diluted to 1 liter. This solution will keep indefinitely.

A practical modification of the Benedict test is available in the Sheftel Kit. It is easily portable and provides an accurate bedside method for home and office use. Another simple method for testing the urine for sugar is by the use of Clinitest.

GERHARDT'S TEST FOR DIACETIC ACID

Diacetic acid is only one of the three abnormal products which may appear in the urine as a result of the incomplete utilization of fat. It is the simplest one to detect.

Directions for the test

To about 10 cc. of fresh urine in a test tube carefully add a few drops of a concentrated solution of ferric chloride, one drop at a time. A wine-red color indicates the presence of diacetic acid. Continue adding the ferric chloride until no further deepening of color is evident. If the color is due to diacetic acid, it will fade upon heating, but if due to certain drugs, it will persist. Pour a portion of the red solution into a second test tube and heat in boiling water for 5 minutes. Compare the two tubes to determine whether the color has faded.

DIRECTIONS FOR THE ADMINISTRATION OF INSULIN

Insulin cannot be given by mouth because it is destroyed by the digestive secretions; it must be given by means of a hypodermic needle and a syringe subcutaneously and not intramuscularly.

Insulin is sold in small rubber-capped vials labeled plainly as to the number of units of insulin in 1 cc. of the solution. (One cc. of U 40 contains 40 units, 1 cc. of U 80 contains 80 units.) Read the label carefully and follow accurately the physician's instructions as to dosage.

An insulin syringe is usually of 1-2 cc. capacity, graduated in tenths of cc. or in units. It has been found practical and safe to use a syringe graduated in units to correspond with the strength of insulin used; thus, U 40 insulin is used with a syringe graduated to U 40 only and without a double graduation. The syringe and the hypodermic needle must be sterile to avoid infection.

It has also been found practical to use a needle about ⅝ inch in length with a metal stop a short distance from the hub. These are special insulin needles and their use avoids the danger of the loss of the needle in the flesh if it should break.

A. Sterilization of Equipment

1. Wash the hands thoroughly with soap and water.
2. Place the separate parts of the syringe and the needle in a large strainer placed in a pan of water. Be sure equipment is covered with water.
3. Bring water to a boil. When it is bubbling, boil 5 minutes.
4. Lift out strainer with equipment and pour water out of pan. Replace strainer with equipment in pan and allow to cool by standing.
5. Wipe the top of the insulin vial with 95 per cent alcohol.

B. Loading the Syringe

1. Insert piston into the barrel without touching the cylinder of the piston. Remove the wire from the needle and fit the needle firmly onto the barrel. Draw out the piston to the amount of insulin prescribed.
2. Push the needle through the rubber cap of the insulin bottle until the point is just visible.
3. Invert the bottle and force all the air in the syringe into the bottle.
4. Withdraw a trace more insulin than is needed.
5. Before removing needle from bottle, and while the bottle is still inverted, expel air or extra insulin, bringing the piston exactly to the proper insulin dosage.

C. Injecting the Insulin

Insulin is best injected where the skin is relatively loose: the outside of the upper arm and the front of the thigh. It is best to administer successive doses in different places.

1. Insulin maps may be used. An area about one-half inch in diameter

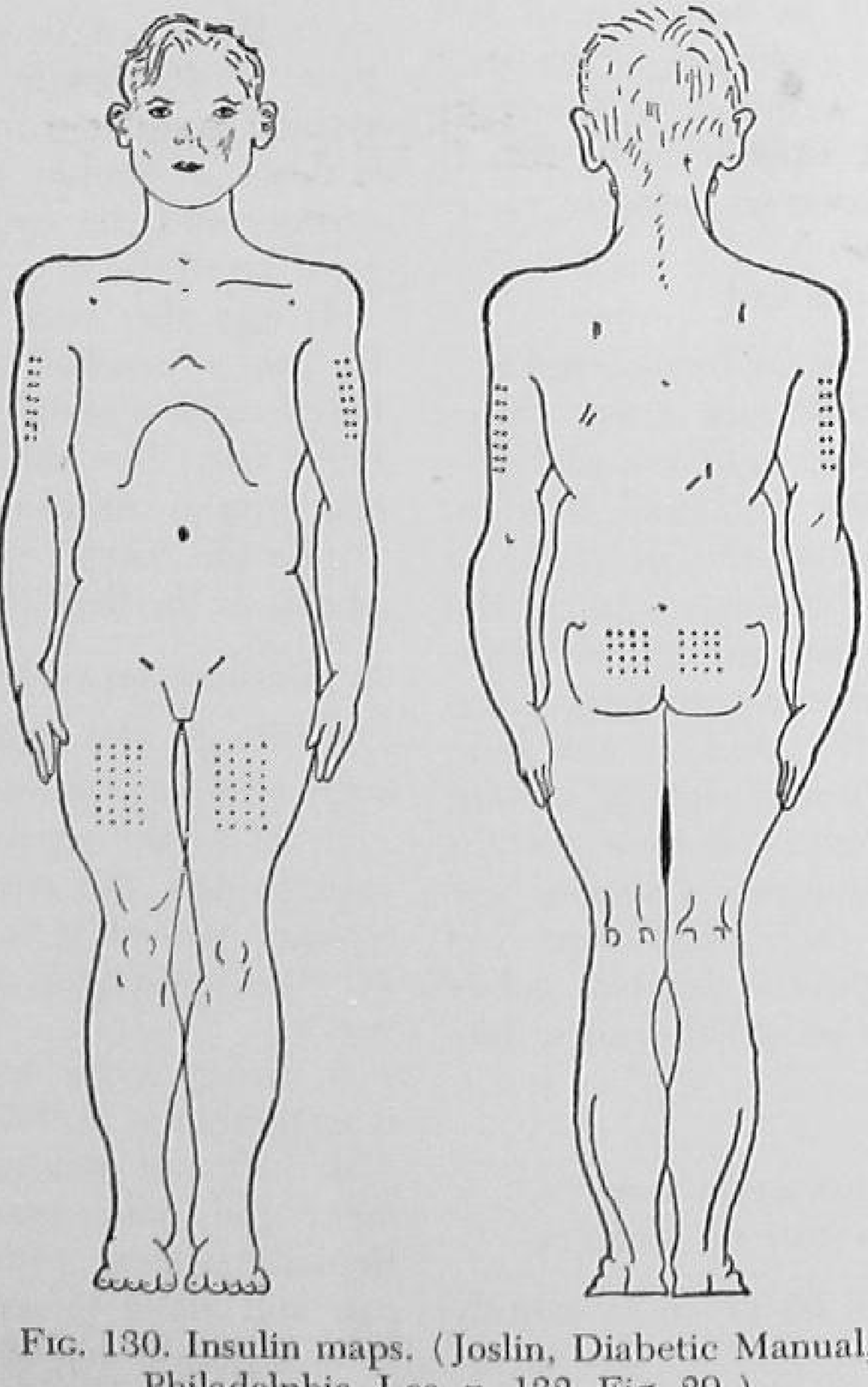


Fig. 130. Insulin maps. (Joslin, Diabetic Manual, Philadelphia, Lea, p. 132, Fig. 29.)

is selected and marked with weak iodine solution or Tincture of Merthiolate and the insulin injected into this area. The antiseptic mark is not rubbed off and the next injection is given immediately adjacent to the first. In this way insulin is not injected at the same site for long periods.

2. Pinch and lift up a fold of skin and insert needle well under skin, holding the syringe at a 45° angle.

3. Expel the insulin gradually by pushing the plunger and withdrawing the needle slowly to avoid leaving all the insulin in one spot.

4. Rub the spot with an alcohol sponge.

D. Care of Equipment

1. Keep the insulin in a refrigerator.

2. Wash syringe and needle in cold water immediately. Warm water and soap may occasionally be necessary. Rinse thoroughly.

3. Allow syringe and needle to air dry. Reassemble the equipment and force some air through the needle a few times to dry it. Separate the equipment and replace the fine wire in the needle.

4. Store in a dry, clean place.

Directions for the Injection of Special Insulin Preparations

PROTAMINE ZINC INSULIN

1. The vial containing the protamine zinc insulin should be kept in the refrigerator. If left in a warm room for only a short time, some of the precipitate will adhere to the glass.

2. The syringe should not only be sterile and dry, but should be cool at time of use. A 24- to 25-gauge needle is preferable.

3. Immediately before injection, the insulin vial should be rotated gently between the hands in order to produce uniform distribution of the sediment without frothing.

GLOBIN AND NPH INSULIN

This is given in the same way as regular or crystalline insulin. (See above.)

INSULIN MIXTURES

In the past few years the injection of mixtures of protamine zinc and regular insulin has become popular treatment. At present there are no prepared mixtures for general use, and the patient must prepare and inject the mixtures each morning as follows:

1. Withdraw the prescribed number of units of regular or crystalline insulin into the syringe.

2. Using the same needle and syringe, withdraw the prescribed number of units of protamine zinc insulin.

3. Inject the mixture under the skin in the usual manner.

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FILMS ON NUTRITION

Although individual films are too numerous to be listed, the following catalogue will be found to be of value:

> Approved Films on Food and Nutrition, Welfare and Health Council of New York City, 44 East 23rd St., New York 10, N. Y., 1948. Price 75 cents. Supplements for 1949-50, 1950-51 and 1952 are available at 25 cents each.

The instructor should also investigate the state department of health, the state university and the commercial rental agencies in her area for the availability of films.

Glossary

The pronunciation follows the system of Webster's New International Dictionary, second edition.

acetone bodies (ăs′ê-tōn). Acetone, acetoacetic acid and beta-oxybutyric acid. Called also ketone bodies. (*See* ketosis, defined below.)

achlorhydria (ā′klōr-hī′drĭ-*ȧ*). Absence or diminished amount of hydrochloric acid in the gastric secretions.

achromotrichia (ȧ-krō′mō-trĭk′-i*ȧ*). Absence of pigment in the hair.

achylia gastrica (ȧ-kī′lĭ-*ȧ* găs′trĭ-k*ȧ*). A condition in which the secretion of gastric juice is diminished or absent.

acidosis (ăs′ĭ-dō′sĭs). A condition in which the body's alkaline reserve is lowered, due to abnormal loss of alkaline salts or abnormal accumulation of acids.

acne (ăk′nê). A chronic inflammatory disease of the sebaceous glands, occurring most frequently on the face, the back and the chest.

acrodynia (ăk-rō-dĭn′ĭ-*ȧ*). An eruptive skin disease. In humans, it is marked by pain in the soles of the feet and the palms of the hands.

ACTH (ā-c-t-h) adrenocorticotropic hormone. A hormone, liberated by the pituitary gland, which stimulates the cortex of the adrenal glands.

adipose (ăd′ĭ-pōs). Fatty.

aerophagy (ā′ēr-ŏf′*ȧ*-jĭ). Swallowing of air.

agranulocytosis (ȧ-grăn′ū-lō-sī-tō′sĭs). A condition in which there is total or nearly total absence of the granular leukocytes (granulocytes) from the blood and the bone marrow.

albuminuria (ăl-bū-mĭ-nū′rĭ-*ȧ*). The presence of albumin in the urine.

alkaline reserve (ăl′k*ȧ*-lĭn). The amount of alkaline or basic material available in the body to neutralize acids.

alkalosis (ăl′k*ȧ*-lō′sĭs). A condition in which there is an excess of alkaline substances in the body.

allergen (ăl′ēr-jĕn). Any substance capable of inducing allergy.

alopecia (ăl′ō-pē′shĭ-*ȧ*). Baldness, deficiency of hair.

amino acid (*ă*-mē′nō ăs′ĭd). A class of organic compounds forming the chief structure of protein.

amylase (ăm′ĭ-lās). An enzyme that digests starch, as ptyalin in the saliva.

anaphylaxis (ăn′*ȧ*-fĭ-lăk′sĭs). Unusual or exaggerated reaction or shock of the organism to foreign substances.

anastomosis (*ȧ*-năs′tō-mō′sĭs). A communication between two vessels; a surgical formation of a passage between two vessels.

anorexia (ăn′ō-rĕk′sĭ-*ȧ*). Lack or loss of appetite for food.

antibiotic (ăn′tĭ-bī-ot′ĭk). Tending to inactivate or destroy bacteria, virus and other living organisms.

antihemorrhagic (ăn′tĭ-hĕm′ŏ-răj′ĭk). Stopping hemorrhage. Often applied to vitamin K.

antineuritic (ăn′tĭ-nū-rĭt′ĭk). Counteracting neuritis. Often applied to thiamine.

antirachitic (ăn′tĭ-r*ă*-kĭt′ĭk). Preventive, curative or corrective of rickets. Often applied to vitamin D.

antiscorbutic (ăn′tĭ-skôr-bū′tĭk). Correcting or curing scurvy. Often applied to ascorbic acid.

antivitamin (ăn′tĭ-vī′tă-mĭn). A substance which may inactivate or destroy a vitamin.

anuria (ă-nū′rĭ-*ȧ*). Absolute suppression of urinary secretion.

arachidonic acid (ăr′ȧ-kĭ-dŏn′ĭk ăs′ĭd). An unsaturated fatty acid, essential for normal nutrition.

arteriosclerosis (är-tē′rĭ-ô-sklē-rō′sĭs). A thickening and a hardening of the walls of arteries and capillaries.

ascites (ă-sī′tēz). Accumulation of fluid in the abdominal cavity.

ascorbic acid (ȧ-skôr′bĭk). Vitamin C, deficiency of which is a causative factor in scurvy.

aspiration (ăs′pĭ-rā′shŭn). The act of breathing or drawing in.

assay (ă-sā′). Examination or analysis of a substance.

asthenia (ăs-thē′nē-*ȧ*). Without strength.

atherosclerosis (ăth′ēr-ô-sklē-rō′sĭs). Fatty degeneration of the connective tissue of the arterial walls.

athrepsia (ā-thrĕp′sē-*ȧ*). Defective nutrition in children.

atonic (*ȧ*-tŏn′ĭk). Lack of normal tone or vigor of an organ or part.

atrophy (ăt′rô-fĭ). A wasting away of a cell, tissue, organ or part.

avidin (*ȧ*-vĭ-dĭn). A proteinlike substance isolated from egg white.

avitaminosis (ȧ-vī′t*ȧ*-mĭn-ō′sĭs). A condition due to the lack or the deficiency of a vitamin in the diet; or to lack of absorption or utilization of it.

bactericidal (băk-tēr′ĭ-sīd′*ă*l). Destructive to bacteria.

base (bās). A substance which combines with acids to form neutral compounds.

benign (bē-nīn′). Mild, favorable for recovery.

bio-assay (bī′ō-*ă*-sā′). Examination or analysis of a substance by noting its effect on animals.

biotin (bī′ō-tĭn). A member of the vitamin B complex.

bradycardia (brăd′ĭ-kär′dĭ-*ȧ*). Abnormal slowness of the heartbeat.

calciferol (kăl-sĭf′ēr-ōl). Vitamin D_2, produced by irradiating ergosterol.

calcification (kăl′sĭ-fĭ-ka′sh*ŭ*n). Process by which organic tissue becomes hardened by a deposit of calcium salts.

calculus, pl. **calculi** (kăl′kū-l*ŭ*s). Commonly called stone.

calorimeter (kăl′ô-rĭm′ē-tēr). An instrument for measuring the heat change in any system (such as the types pictured in Chapter 5, one of which is used to measure the amount of heat produced by the body), and the bomb calorimeter used to measure the calorie (energy) value of foods.

carotene (kăr′ô-tēn). A yellow pigment which exists in several forms; alpha, beta and gamma carotene are provitamins which may be converted into vitamin A in the body.

casein (kā′sē-ĭn). The principal protein of milk, the basis of cheese.

cheilosis (kī-lō′sĭs). A condition marked by lesions on the lips and cracks at the angles of the mouth.

cholecystitis (kŏl′ē-sĭs-tī′tĭs). Inflammation of the gallbladder.

cholecystokinin (kō′lē-cyst′ô-kī′nĭn). A hormone produced in the wall of the duodenum in the presence of fat, which stimulates the contraction of the gallbladder.

cholelithiasis (kŏl′ē-lĭ-thī′*ȧ*-sĭs). The presence or formation of gallstones.

cholesteremia (kô-lĕs-tē-rē′mĭ-*ȧ*). Excess of cholesterol in the blood.

cholesterol (kô-lĕs′tēr-ōl). The most common member of the sterol group, defined below.

choline (kō′lēn). A component of lecithin. Necessary for fat transport in the body. Prevents the accumulation of fat in the liver.

chyme (kīm). The thick, grayish, semiliquid mass into which food is converted by gastric digestion. In this form it passes into the small intestines.

cirrhosis (sĭ-rō′sĭs). Inflammation with hardening of the tissues of an organ, more especially the liver.

citrovorum factor (sĭt′rô-vō′rŭm făk′tẽr). A vitamin belonging to the B complex closely related to vitamin B_{12}.

colitis (kô-lī′tĭs). Inflammation of the colon.

collagen (kŏl′ȧ-jĕn). The main organic constituent of connective tissue and of the organic substance of bones: changeable by boiling into gelatin.

colloidal (kŏ-loi′dăl). Pertaining to a colloid, which is a substance containing tiny, solid, evenly dispersed particles not dissolved in the medium, but which will not settle out. Glue is an example.

congenital (kŏn-jĕn′ĭ-tăl). Existing at or before birth.

cortex (kôr′tĕks). The outer layers of an organ as distinguished from its inner substance.

cortisone (côr′tē-sôn). A synthetic, hormonelike substance, similar to the adrenal cortex hormones.

creatine (krē′ȧ-tēn). A nitrogenous end product of muscle metabolism.

cystic fibrosis (sĭs′tĭk fī-brō′sĭs). Fibrosis of the pancreatic ducts resulting in diminished excretion of pancreatic digestive enzymes.

cystitis (sĭs-tī′tĭs). Inflammation of the urinary bladder.

deaminization (dē-ăm′ĭn-ĭ-zā′shŭn). The process of metabolism by which the nitrogen portion (amino group) is removed from protein substances.

dehydration (dē′hī-drā′shŭn). Removal of water from the body or a tissue.

dermatitis (dûr′mȧ-tī′tĭs). Inflammation of the skin.

desoxycorticosterone (dĕs-ŏx′ē-cŏrt′ē-cō-stē-rōn′). A hormone produced by the cortex of the adrenals.

detoxication (dē-tŏk′sĭ-kā′shŭn). Reduction of the toxic properties of a substance.

diuresis (dī′ū-rē′sĭs). Increased secretion of urine.

diverticulosis (dī′vẽr-tĭk-û-lō′sĭs). The presence of small pouches or pockets leading off a main cavity or tube. Often occurs in the intestines.

dysentery (dĭs′ĕn-tẽr-ĭ). Inflammation of intestinal mucous membrane, especially the colon. The causative agent may be bacteria or parasitic worms.

dyspepsia (dĭs-pĕp′shȧ). Imperfect digestion. Not a disease in itself, but a symptom of some other disorder.

dyspnea (dĭsp-nē′ȧ). Difficult or labored breathing.

dystrophy (dĭs′trô-fĭ). Progressive weakening of a muscle.

eclampsia (ĕk-lămp′sĭ-ȧ). A sudden attack of convulsions. A severe manifestation of toxemia of pregnancy.

eczema (ĕk′zê-mȧ). A skin disease.

edema (ê-dē′mȧ). An accumulation of large amounts of fluid in the intertissue spaces of the body.

emaciation (ê-mā′sĭ-ā′shŭn). A wasted condition of the body.

emulsion (ê-mŭl′shŭn). A finely divided mixture or suspension of two liquids not mutually soluble.

endemic (ĕn-dĕm′ĭk). Pertaining to or prevalent in a particular district or region.

endocarditis (ĕn′dô-kär-dī′tĭs). Inflammation of the endocardium (inner lining membrane of the heart).

endocrine (ĕn′dô-krīn). Applied to organs whose function it is to secrete internally a substance which plays an important role in metabolism.

endogenous (ĕn-dŏj′ê-nŭs). Originating within the organism.

enzyme (ĕn′zīm). A substance, frequently protein in nature and formed in living cells, which brings about chemical changes.

epithelium (ĕp′ĭ-thē′lĭ-ŭm). The outer layers of the skin and the mucous membranes, consisting of cells of various forms and arrangement.

ergosterol (ẽr-gŏs′tẽr-ōl). A sterol found in plant and in animal tissues which, on exposure to ultraviolet light, is converted into vitamin D_2 (*See* sterol.)

erythrocyte (ê-rĭth'rô-sīt). Red blood corpuscle.

etiology (ē'tĭ-ŏl'ô-jĭ). The study of the causation of a disease.

exogenous (ĕks-ŏj'ê-nŭs). Originating outside the organism.

extractive (ĕx-trăk'tĭv). Any substance present in a tissue or in a mixture in a small quantity, and requiring to be extracted by a special method.

extrinsic (ĕks-trĭn'sĭk). Coming from, or originating from, outside.

febrile (fē'brĭl). Pertaining to, or accompanied by, fever.

feces (fē'sēz). Excrement; the discharge of the bowels.

ferment (fûr'mĕnt). An enzyme, defined above.

fetus (fē'tŭs). The product of conception after the fourth month of pregnancy.

fibrosis (fī-brō'sĭs). The formation of fibrous connective tissue.

fistula (fĭs'tû-lȧ). An abnormal tube-like passage in the body.

flatulence (flăt'ū-lĕns). Distention of the intestinal tract with gas or air.

folacin (fō'lă-sĭn). A new term for folic acid, a vitamin of the B complex.

folic acid (fō'lĭc ăs'ĭd). A vitamin of the B complex group, known also as pteroylglutamic acid.

friable (frī'à-b'l). Easily broken or crumbled.

gavage (gà'vàzh'). Feeding by the stomach tube.

geriatrics (jĕr'ĭ-ăt'rĭks). Study and treatment of the problems and the diseases of old age.

gestation (jĕs-tā'shŭn). Period of fetal development. Pregnancy.

glossitis (glŏs-ī'tĭs). Inflammation of the tongue.

glycemia (glī-sē'mĭ-ȧ). Presence of an abnormally large amount of sugar in the blood.

glyceride (glĭs'ĕr-ĭd). A compound formed when glycerin and an acid are combined.

glycogen (glī'kô-jĕn). A carbohydrate, similar in composition to starch. In this form, carbohydrate is stored temporarily in the liver and the muscles.

glycosuria (glī'kô-sū'rĭ-ȧ). Presence of sugar in the urine.

hemeralopia (hĕm'ēr-ȧ-lō'pĭ-ȧ). Day blindness; inability to see in a bright light.

hemicellulose (hĕm'ĭ-sĕl'û-lōs). Carbohydratelike substance in the cell wall of plants. Indigestible, but it absorbs water, thereby stimulating laxation.

hemolytic (hē'mô-lĭt'ĭk). Pertaining to the breaking down of red blood corpuscles.

hemorrhage (hĕm'ŏ-rĭj). A copious escape of blood from the vessels; bleeding.

hemorrhoid(s) (hĕm'ŏ-roid). Vascularlike tumors of the rectal mucous membrane.

hepatic (hê-păt'ik). Pertaining to the liver.

histamine (hĭs'tȧ-mēn). A nitrogenous substance in the body, found wherever tissues are damaged. A stimulator of the autonomic system and used to stimulate gastric secretion.

homogenized (hô-mŏj'ê-nīzd). Made homogeneous. Usually applied to dispersing milk fat in such fine globules that cream will not rise to the top.

hormone (hôr'mōn). A chemical substance which is produced in an organ and transported to another organ, where it produces a specific effect.

hydrolysate (hī-drŏl'ĭ-sāt). A product of hydrolysis. Often applied to protein.

hydrolysis (hī-drŏl'ĭ-sĭs). A chemical reaction in which a compound is broken down with the chemical addition of water and the formation of a new compound.

hyperchlorhydria (hī'pēr-klōr-hī'drĭ-ȧ). Excessive secretion of hydrochloric acid in the stomach.

hyperemia (hī'pēr-ē'mē-ȧ). A congestion of blood.

hyperglycemia (hī′pēr-glī-sē′mē-ȧ). An increase in the normal blood sugar level.

hyperlipemia (hī′pēr-lī-pē′mĭ-ȧ). Excess of fat or lipoids in the blood.

hyperthermia (hī′pēr-thûr′mĭ-ȧ). Fever.

hypertrophic (hī′pēr-trŏf′ĭk). Pertaining to an enlargement or overgrowth of an organ, or part, due to a diseased condition.

hypocalcemia (hī′pō-kăl-sē′mē-ȧ). Abnormally low blood calcium.

hypochlorhydria (hī′pô-klōr-hī′drĭ-ȧ). Diminished secretion of hydrochloric acid in the stomach.

hypoglycemia (hī′pô-glī-sē′mĕ-ȧ). A decrease in the normal blood sugar level.

hypophysis (hī-pŏf′ĭ-sĭs). Any outgrowth, especially referring to the pituitary gland.

hypoproteinemia (hī′pô-prō′tē-ĭn-ē′mĕ-ȧ). A decrease in the normal quantity of protein in the blood.

icterus (ĭk′tēr-ŭs). Jaundice

idiopathic (ĭd′ĭ-ô-păth′ĭk). Self-originated; occurring without known cause

incipient (ĭn-sĭp′ĭ-ĕnt). Beginning to exist.

inositol (ĭn-ō′sĭ-tōl). A member of the vitamin B complex.

interstitial (ĭn′tēr-stĭsh′ăl). In the spaces between the cells.

intrinsic (ĭn-trĭn′sĭk). Situated entirely within; pertaining to itself.

isotopes (ī′sô-tōps). Two or more chemical elements which have the same atomic number and identical chemical properties, but which differ in atomic weight or in the structure of the nucleus.

keratinize (kĕr′ȧ-tĭn-īz). To become hornylike.

ketogenic (kē′tō-jĕn′ĭk). Capable of being converted into ketone bodies. Ketogenic substances in metabolism are the fatty acids and certain amino acids.

ketosis (kê-tō′sĭs). A condition in which there is an accumulation in the body of the ketone bodies (*See* acetone bodies) as a result of incomplete oxidation of the fatty acids.

kwashiorkor (kwä-shī-ōr′kēr). A deficiency disease common in Africa. Probably due to a multiple deficiency, including protein.

labile (lā′bĭl). Not fixed; unstable.

lacteal(s) (lăk′tê-ăl). Tiny vessels in the intestinal wall through which fat is absorbed; part of the lymphatic system.

lavage (lăv′ĭj). The washing out of an organ, such as the stomach.

lecithin (lĕs′ĭ-thĭn). A fatlike substance containing phosphorus. Found in the blood and cells of the body. It may be the form in which fat is transported in the body.

leukemia (lû-kē′mĭ-ȧ). A disease of the blood-forming organs, characterized by a marked increase of the white corpuscles.

leukocyte (lū′kô-sīt). White blood corpuscles.

leukopenic (lū′kô-pĕn′ĭk). Pertaining to leukopenia (reduction of leukocytes in the blood).

linoleic acid (lĭn′ô-lē′ĭk ăs′ĭd). An unsaturated fatty acid essential for nutrition.

linolenic acid (lĭn′ô-lē′nĭk ăs′ĭd). An unsaturated fatty acid essential for nutrition.

lipid (lĭp′ĭd), **lipoid** (lĭp′oid). Fat or fatlike substances.

macrocyte (măk′rô-sīt). Abnormally large red blood corpuscle.

malignant (mȧ-lĭg′nȧnt). Severe form of occurrence, tending to grow worse.

marasmus (mȧ-răz′mŭs). Wasting and emaciation, especially in infants.

matrix (mā′trĭks). The intercellular framework of a tissue.

menadione (mĕ-nă-dī′ōn). Vitamin K.

metabolism (mĕ-tăb′ô-lĭz′m). General term to designate all chemical changes

which occur in living matter. These changes are of two types—constructive and destructive.

methionine (mĕth-ī'ō-nĭn). An amino acid important for its contribution to fat metabolism.

microcyte (mī'krô-sīt). An undersized red blood corpuscle.

miscible (mĭs'ĭ-b'l). Capable of being mixed.

milt (mĭlt). The spleen.

mucosa (mû-kō'sȧ). Mucous membrane lining passages and cavities, as in the gastro-intestinal tract.

myocarditis (mī'ô-kär-dī'tĭs). Inflammation of the myocardium (heart muscle).

myosin (mī'ô-sĭn). A protein of muscle plasma.

myxedema (mĭk'sê-dē'mȧ). Condition due to a deficiency of thyroid secretion.

necrosis (nĕ-krō'sĭs). Death of a circumscribed area of tissue.

neoplasm (nē'ô-plăz'm). Any new and abnormal growth such as a tumor.

neurasthenia (nū'răs-thē'nĭ-ȧ). Nervous exhaustion characterized by abnormal fatigue.

neurogenic (nū'rô-jĕn'ĭk). Forming nerve tissue. Originating in the nervous tissue.

niacin (nī'ȧ-sĭn). A member of the vitamin B complex, formerly known as nicotinic acid. An antipellagra factor.

nucleoprotein (nū'klê-ô-prō'tê-ĭn). The conjugated protein found in the nuclei of cells.

nyctalopia (nĭk'tȧ-lō'pĭ-ȧ). Night blindness; imperfection of vision at night or in a dim light.

ophthalmia (ŏf-thăl'mĭ-ȧ). Severe inflammation of the eye.

osmotic pressure (ŏs-mŏt'ĭk). Unbalanced pressure, causing the phenomenon of osmosis (the passage of a solvent through a membrane separating solutions of different concentrations).

ossification (ŏs'ĭ-fĭ-kā'shŭn). Formation of bone or bony substance.

osteomalacia (ŏs'tê-ô-mȧ-lā'shĭ-ȧ). Softening of the bone.

oxidation (ŏk'sĭ-dā'shŭn). A chemical process by which a substance combines with oxygen. In the body the rate of oxidation depends upon cell activity, not the intake of oxygen.

pantothenic acid (păn'tô-thĕn'ĭk). A member of the vitamin B complex.

parenchyma (pȧ-rĕng'kĭ-mȧ). The functional part of an organ as distinguished from its framework.

para-aminobenzoic acid (păr'ȧ-ă-mē'nô-bĕn-zō'ĭk ăs'ĭd). A vitamin of the B complex group, a deficiency of which resulted in graying of dark hair of rats and other animals.

parenteral (păr-ĕn'tĕr-ăl). Not through the alimentary canal; i.e., subcutaneously or intravenously.

parturition (pär-tû-rĭsh'ŭn). The act or process of giving birth to a child.

peptone(s) (pĕp'tōn). A protein produced by hydrolysis of a native protein. (*See* proteoses.)

pericarditis (pĕr'ĭ-kär-dī'tĭs). Inflammation of the pericardium (membrane surrounding the heart).

peristalsis (pĕr'ĭ-stăl'sĭs). The wavelike movement by which the alimentary tract propels its contents.

pernicious (pēr-nĭsh'ŭs). Tending to be serious or fatal.

phagacytosis (făg'ō-sī-tō'sĭs). The engulfing of micro-organisms and cells by phagocytes—usually white blood corpuscles or other related cells.

phospholipid (fŏs'fô-lĭp'ĭd). A fat in which one fatty acid is replaced by phosphorus and a nitrogenous compound.

polycythemia (pŏl'ĭ-sī-thē'mĭ-ȧ). Excess of red corpuscles in the blood.

polydipsia (pŏl'ĭ-dĭp'sĭ-ȧ). Excessive thirst.

polyneuritis (pŏl-ĭ-nū-rī'tĭs). Inflammation of many nerves.

polyphagia (pŏl'ĭ-fā'jĭ-ȧ). Excessive hunger.

polyuria (pŏl'ĭ-ū'rĭ-*ȧ*). Excessive secretion and discharge of urine.

precursor (prē-kûr'sẽr). A substance which is converted into another.

premature infant (prē'm*ȧ*-tūr'). An infant born before term.

prognosis (prŏg-nō'sĭs). Prospect as to recovery from a disease.

prophylaxis (prō'fĭ-lăk'sĭs). The prevention of disease.

proteinuria (prō'tē-ĭ-nū'rĭ-*ȧ*). Presence of protein in the urine.

proteolytic (prō'tē-ō-lĭt'ĭk). Effecting the digestion of proteins.

proteose(s) (prō'tē-ōs). An intermediate product of enzymatic hydrolysis of protein between protein and peptone.

protoplasm (prō'tō-plăz'm). The essential living matter in a cell. The only known form of matter in which life is manifested.

provitamin (prō'vī't*ȧ*-mĭn). The forerunner of a vitamin. Provitamin A is carotene.

pteroylglutamic acid (tĕr-ōl-glū-tăm'ĭc ăs'ĭd). (*See* folic acid.)

ptyalin (tī'*ȧ*-lĭn). The amylase of saliva.

purine(s) (pū'rēn). End products of nucleoprotein metabolism.

putrefaction (pū'trē-făk'sh*ŭ*n). The decomposition of animal matter, especially protein, caused by certain kinds of bacteria.

pyelitis (pī'*ĕ*-lī'tĭs). Inflammation of the pelvis of the kidney.

pyridoxine (pĭ-rĭ-dŏk'sĭn). Vitamin B_6, a member of the vitamin B complex.

radiography (rā'dĭ-ŏg'r*ȧ*-fĭ). Photography with the roentgen rays. The making of x-ray pictures.

remission (rē-mĭsh'*ŭ*n). The period of abatement of symptoms, or the lessening of their severity.

renal (or kidney) **threshold** (rē'năl thrĕsh'ōld). The level at which a given substance is filtered faster than it can be reabsorbed. Usually applied to sugar.

rennin (rĕn'ĭn). The milk-curdling enzyme of the gastric juice.

reticulocyte (rē-tĭk'ū-lō-sīt'). A young red blood cell.

retina (rĕt'ĭ-n*ȧ*). Innermost and the perceptive structure of the eye, formed by the expansion of the optic nerve.

riboflavin (rī'bō-flā'vĭn). Vitamin B_2 or G; heat-stable factor of B complex.

saponification (s*ȧ*-pŏn'ĭ-fĭ-kā'sh*ŭ*n). The splitting of fat by an alkali, yielding glycerol and soap. This may occur during the digestion of fat.

satiety (s*ȧ*-tī'*ĕ*-tĭ). Fullness or gratification of appetite.

sclerosis (sklē-rō'sĭs). Hardening, a chronic thickening of a part due to inflammation and disease.

spasmophilia (spăz'mō-fĭl'ĭ-*ȧ*). A tendency to spasm and convulsions.

spastic (spăs'tĭk). Characterized by spasms or convulsions.

sphincter (sfĭngk'tẽr). A ringlike muscle which closes a natural opening.

stasis (stā'sĭs). A stoppage of the flow of blood or other body fluid in any part.

steatorrhea (stē'*ȧ*-tō-rē'*ȧ*). Presence of an excess of fat in the stools.

sterol (stĕr'ōl). Fat-soluble substances of a complex molecular structure.

stomatitis (stō-m*ȧ*t-ī'tĭs). Inflammation of the mouth.

suet (sū'ĕt). Hard fat of beef and mutton.

syndrome (sĭn'drōm). A set of symptoms which occur together.

synthesis (sĭn'thē-sĭs). The process of building up a chemical compound.

tetany (tĕt'*ȧ*-nĭ). A condition characterized by intermittent spasms, muscle twitchings and cramps usually involving the extremities.

thiamine (thī'ăm-ĭn). Vitamin B_1. Antineuritic factor.

thiochrome (thī'ō-krōm). The yellow coloring matter of yeast. It may be prepared by oxidizing thiamine.

tocopherol (tō-kŏf'ẽr-ōl). An alcohol-like substance which has the properties of vitamin E.

toxemia of pregnancy (tŏks-ē'mē-*ă* prĕg'n*ă*n-sē). A toxic condition of unknown

etiology which occurs only in pregnancy.

trauma (trô′mȧ). An injury or a wound.

trichinosis (trĭk′ĭ-nō′sĭs). A disease due to infection with trichinae—parasites found in raw pork.

trimester (trī-mĕs′tẽr). A period of three months.

ultraviolet light (ŭl′trȧ-vī′ō-lĕt). Rays of shorter wave length than visible light. Sunlight is the natural source, but it may be derived from various kinds of electrical devices.

urea (û-rē′ȧ). The chief nitrogenous end product of protein metabolism in the body.

uremia (û-rē′mĭ-ȧ). Toxic condition produced by the presence of urinary constituents (waste products) in the blood.

urobilinogen (û′rô-bĭ-lĭn′ô-jĕn). An excretory product in the urine derived from one of the bile pigments. Bile pigments are derived from degenerated hemoglobin.

urticaria (ûr′tĭ-kā′rĭ-ȧ). Hives, nettle rash.

vascular (văs′kû-lẽr). Pertaining to, or full of, vessels.

viosterol (vī-ŏ′stẽr-ōl). A solution of irradiated ergosterol in oil; vitamin D_2.

xerophthalmia (zē′rŏf-thăl′mĭ-ȧ). A dry and lusterless condition of the eyes resulting from a vitamin A deficiency.

zein (zē′ĭn). A protein obtained from corn.

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